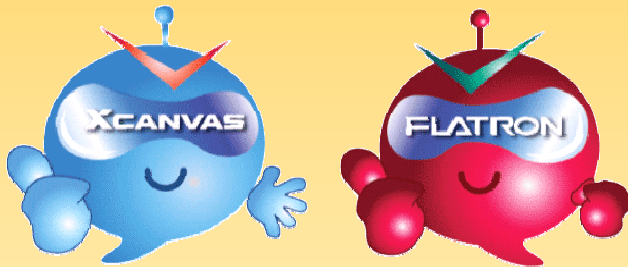


Great Company Great People

**XCUTE 125**



2005.06.27

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# Training Manual (PDP)



**LG Electronics** Display Div. SCR Gr.

# Contents

1. Introduction
2. Precautions
3. Basic
4. Trouble Shooting
5. Configuration Diagram
6. Line SVC Mode
7. New Mount



## PDP module

PDP composed with PANEL part and DRIVE part.

Panel is consist of electrode, phosphor, dielectric, gas.

And drive part is made up of electronic circuit

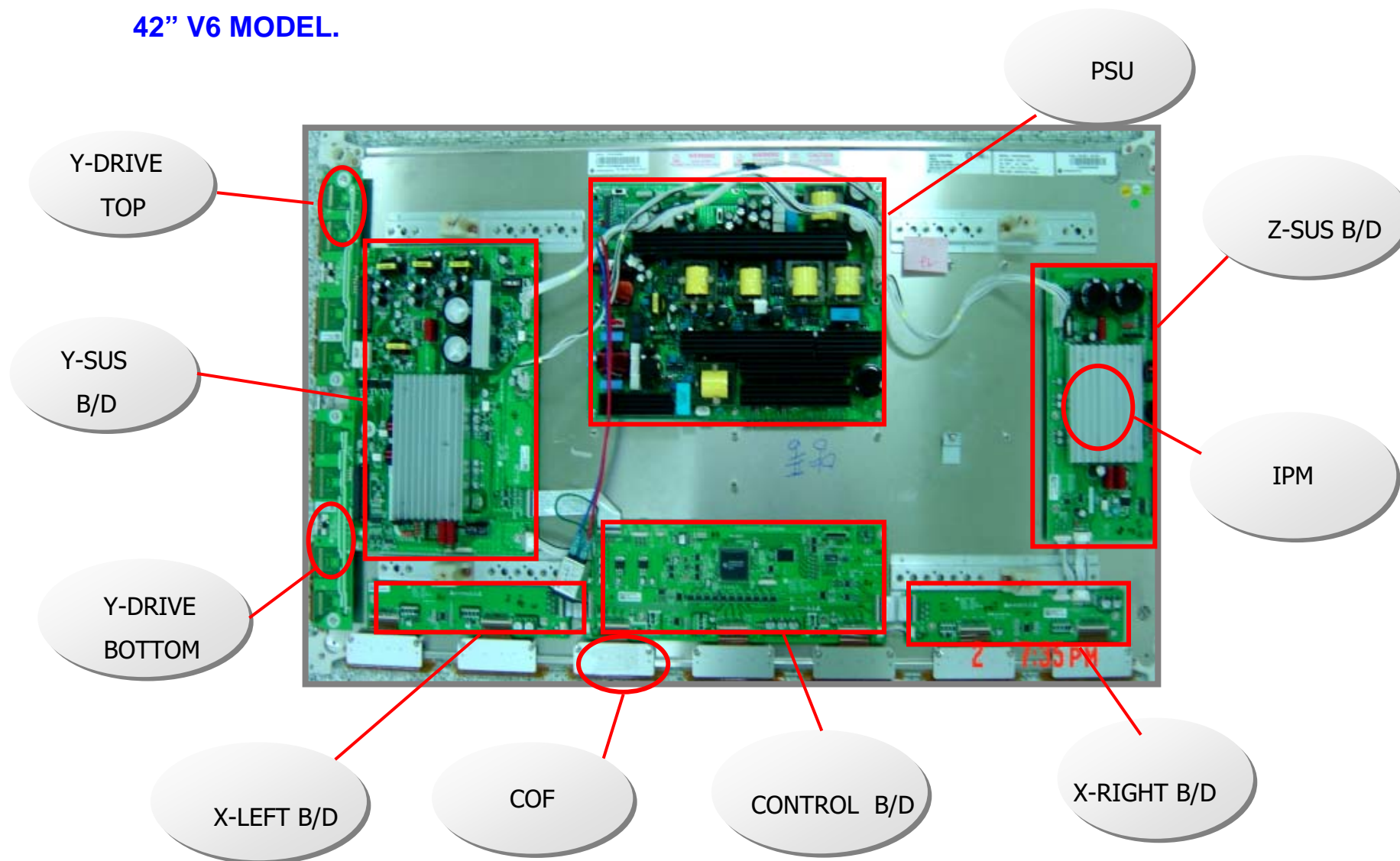
(X , Y-sus, Z sus, Y drv,PSU,CTRL B/D) and PCB.



- PDP 76" Full HD  
World First Development Oct. 2003

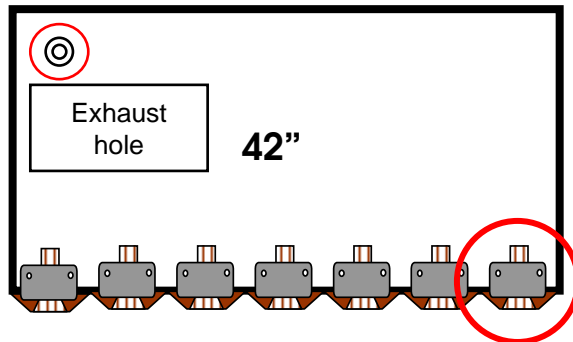
1. We want to communicate harmoniously by educating a defect phenomenons and terms to send a message that include a defect articles to LGE exactly.
2. Let customers can distinguish module defect(lge defect) and their work defect by educating an early analysis for SET maker .So customers can decide easily whether he ask a c/s or not.
3. Prevent defects which is made during set assembly process previously by educating Work precautions and conditions.

## 42" V6 MODEL.



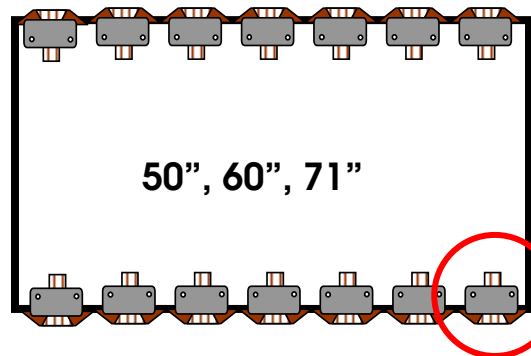
## ■ Definition of MODULE position

\* Back side of module



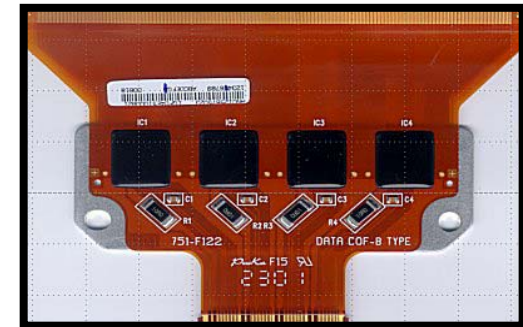
COF

\* Back side of module

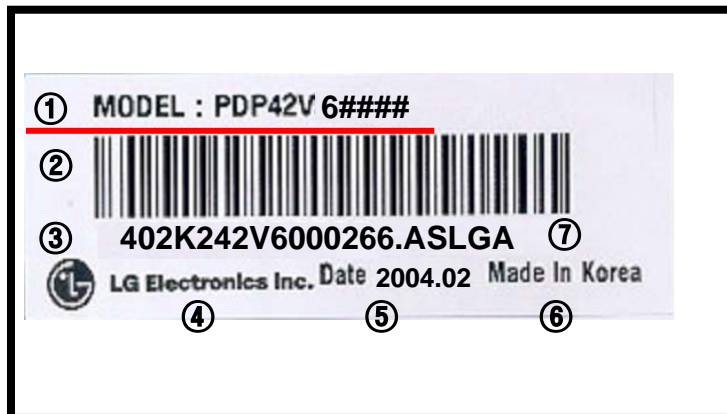


COF

\* COF



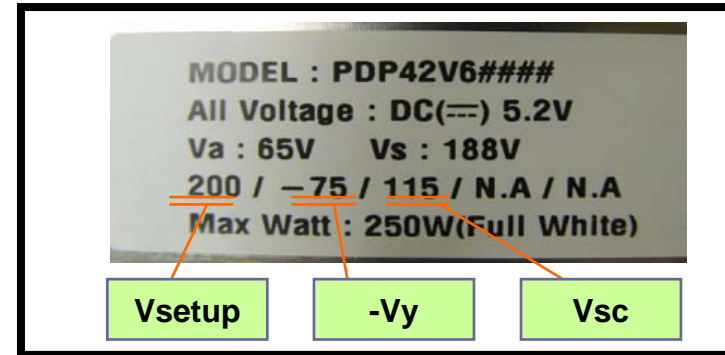
## ■ Identification label



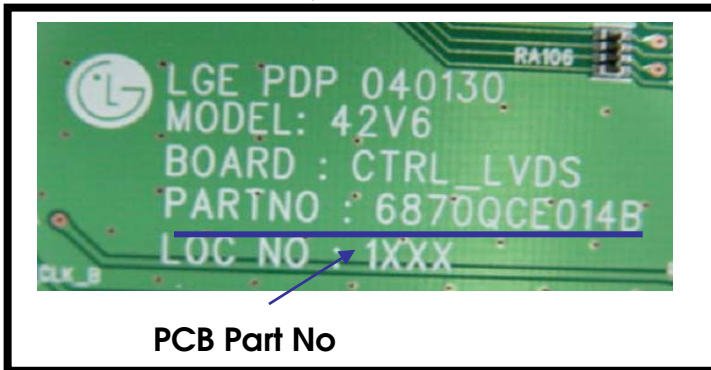
- ① Model Name
- ② Bar Code  
(Code 128, Contains the manufacture No.)
- ③ Manufacture No.
- ④ The trade name of LG Electronics
- ⑤ Manufactured date (Year & Month)
- ⑥ The place Origin
- ⑦ Model Suffix

## ■ Voltage label

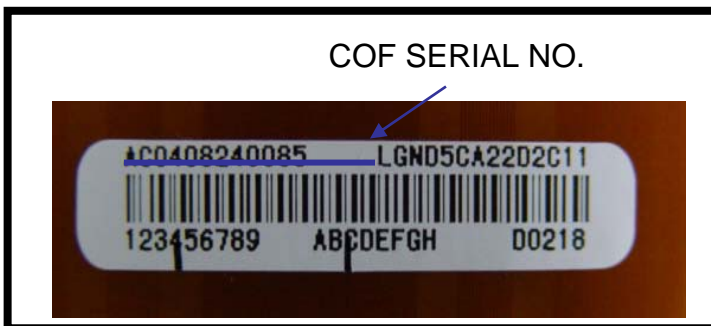
(Attached on back side of module)



## ■ Part No. label (Attached on board)

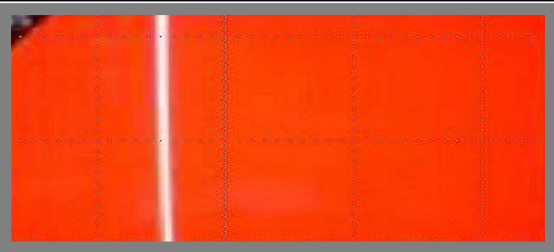
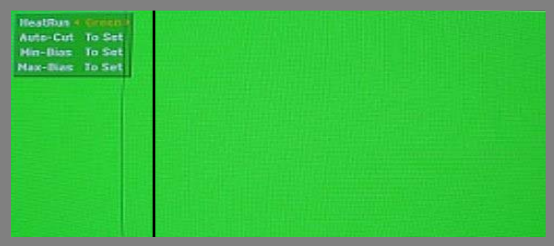




## ■ COF serial No. label (attached on COF)





**■ Terms of defect**

Term	Appearance
Add short (line on)	
Add open (line off)	
Sus short (line on)	
Sus open (line off)	

## Safety precautions

**Be sure to read this before service. When using/ handling this PDP module, Please pay attention to the below warning and cautions.**

1. Before repairing there must be a preparation for 10 min.
2. Do not impress a voltage that higher than represented on the product.
3. Since PDP module uses high voltages, Be careful a electric shock  
and after removing power some current remains in drive circuit.  
so you can touch circuit after 1 min.
4. Drive circuits must be protected from static electricity.
5. The PDP module must be Moved by two man.
6. Be careful with short circuit of PDP boards when measuring any voltages.

## Before request service

1. Check panel surface and appearance of B/D.
  2. Check the model label. Whether it is boards of same model with label.
  3. Before requesting Service, please inform us a detail defect phenomenon and history of module.  
it can be helpful to us for a smooth sevice.
- Ex) COF long 2-1 fail ,address 1 line open, Y b/d problem , mis-discharge.

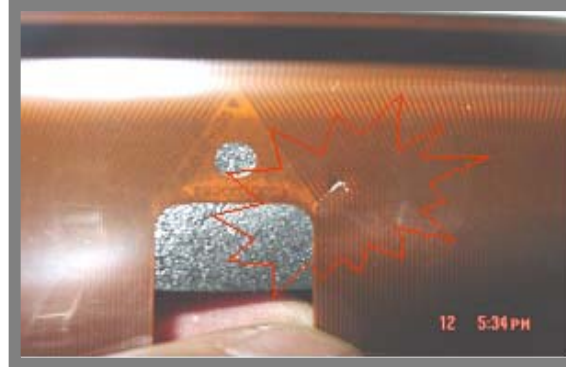


COF is the most important component in the PDP module.

Even a little imperfection of COF can make a serious screen problem.



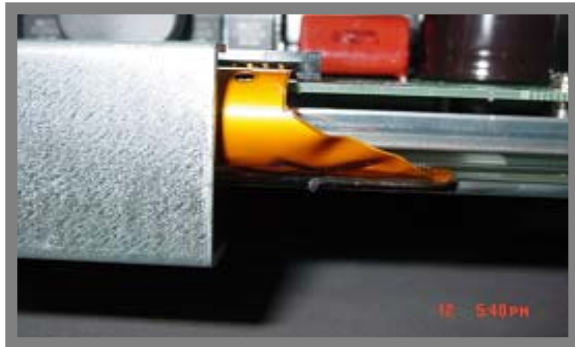
Scratching



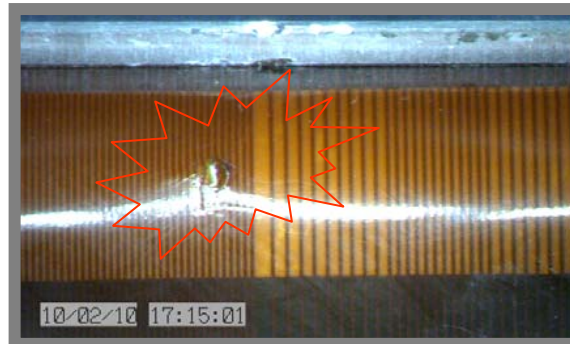
Tearing



Being Pushed

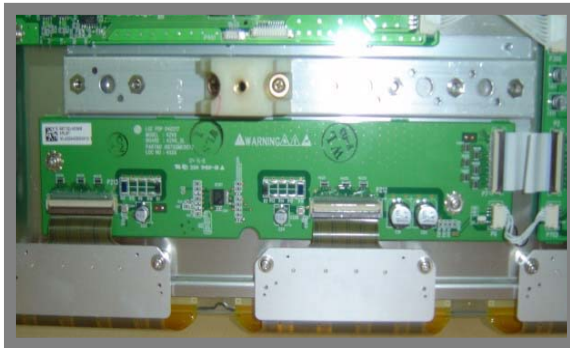


Bending

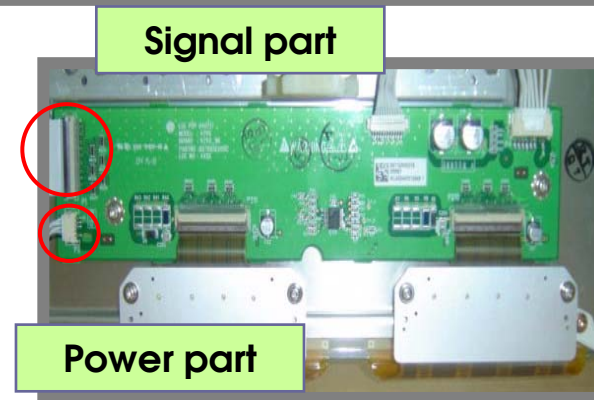


Chopping

receiving LOGIC signal from CONTROL B/D and make ADDRESS PULSE(generates Address discharge)by ON/OFF operation, and supplies this waveform to COF(data)

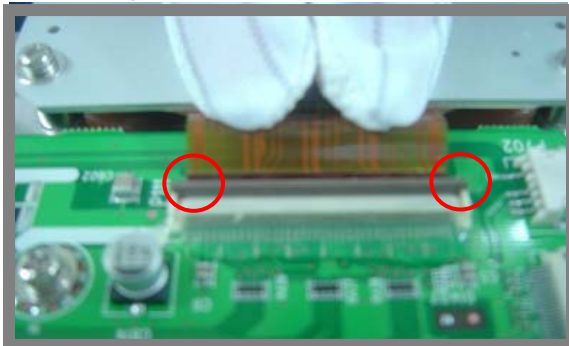


X LEFT B/D

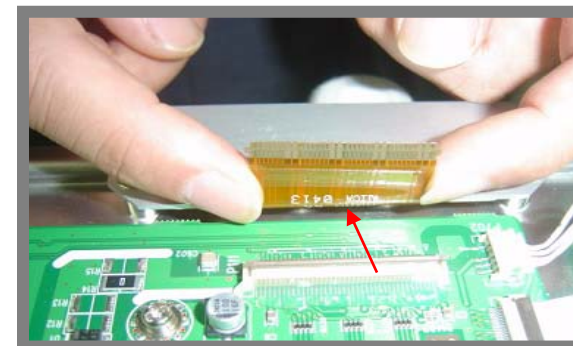


X RIGHT B/D

## COF Separating



Lift up lock as shown in narrow.



Pull COF as shown in narrow.

: make SUSTAIN PULSE and ERASE PULSE that generates SUSTAIN discharge in panel by receiving LOGIC signal from CONTROL B/D.

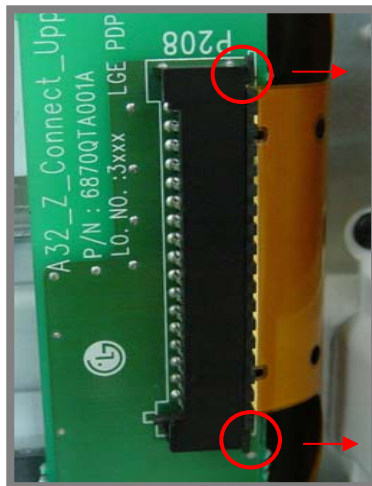
this waveform is supplied to panel through FPC(Z).

\*composed with IPM,FET,DIODE, electrolytic capacitor ,E/R coil.

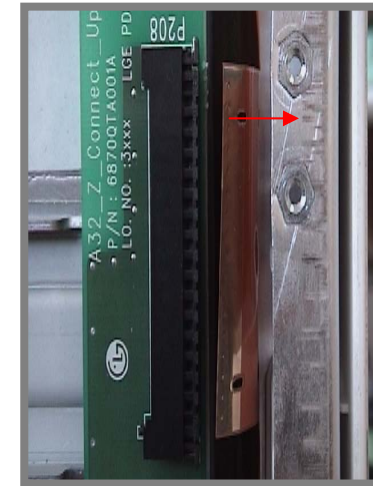


\* IPM (Intelligent Power Module)  
E/R(Energy recovery)

### FPC Separating



Separate the fixed Screw of Z-Board Condition in Lock part is pulled  
Pull out Lock as shown in arrow.



Pull FPC Connector  
as shown in arrow.



- 1) This is a path to supply SUSTAIN ,RESET waveform which made from Y SUSTAIN B/D to panel through SCAN DRIVER IC.
- 2) Supply a wave form that select Horizontal electrode (Y SUSTAIN electrode) sequentially.
  - potential difference is 0V between GND and Vpp of DRIVER IC in SUSTAIN period.
  - being generated potential difference between GND and Vpp only in SCAN period.

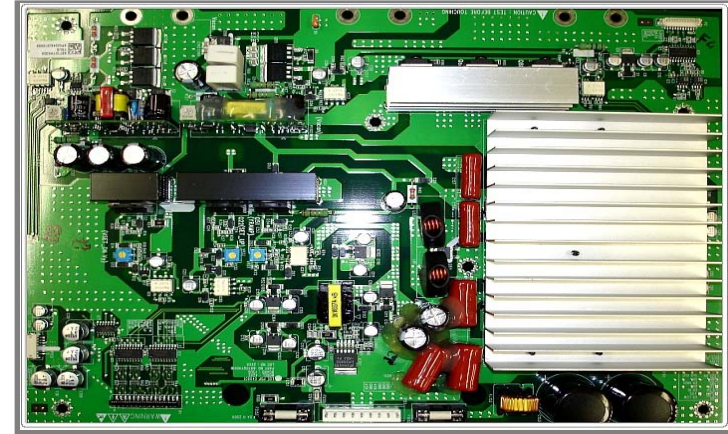
\* In case of 42" V6 use DRIVER IC IC 8 EA (TOP, BOTTOM: each 4EA)



### Y sustain B/D

: generates SUSTAIN,RESET waveform, Vsc(SCAN)voltage.  
and supplies it Y DRIVER B/D.

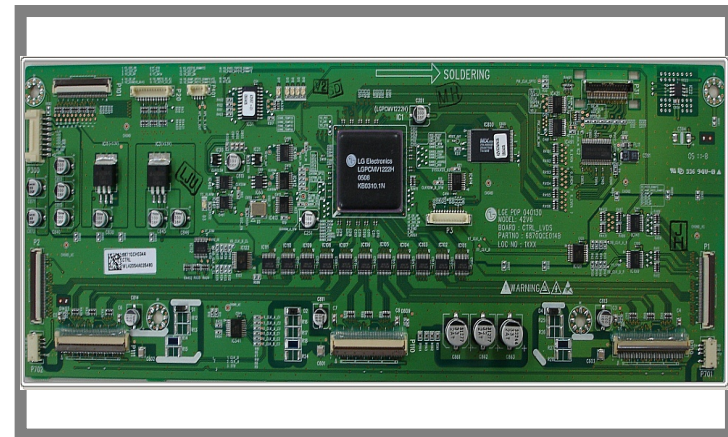
\* Composed with IPM,DIODE, electrolytic capacitor ,FET.



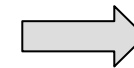
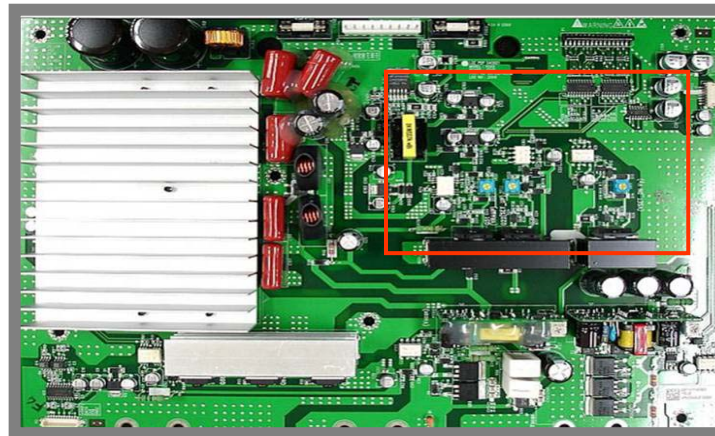
### Control Board

: creates signal processing (Contour noise, reduction SM,..)  
and an order of many FET on/off of each DRIVER B/D with  
R,G,B each 8bit input.

\* Use 3.3V/5V 2 kinds of power .



Being impressed 5V,  $V_a$ ,  $V_s$ ,  
DC/DC converter makes  
5V,  $V_a$ ,  $V_s$ ,  $V_{set\_up}$ ,  $V_{sc}$   
which is essential for each B/D.  
There is no DC/DC B/D in  
model 40 " /42 " (1 POWER B/D).  
\* 50 " 60 " embedded DC/DC B/D  
separately because of high power  
consumption.



DC/DC con.  
part



## FPC (Flexible Printed Circuit)

- : supply a driving waveform to PANEL by connecting a PAD electrode of PANEL with PCB(Y and Z).
- \* there is two type of this for Y B/D. One is single-sided, another is double-side. These are having pattern on it
- \* for Z B/D, there is no pattern , single-sided, and Beta type(all of copper surface).



## FFC (Flat Flexible Cable)

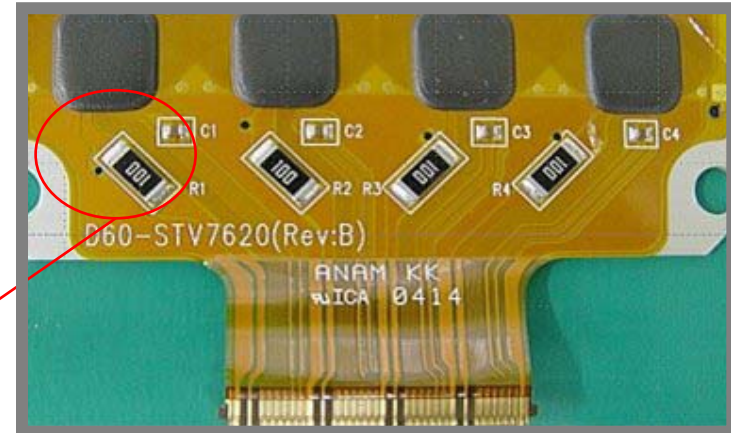
- : for connecting a Logic signal between B/D and B/D.
- \*There is 0.5mm pitch,50pin type
- 1mm pitch ,30pin type.



: supply a waveform which made from X B/D to panel and select a output pin that is controlled by COF when be on or off.

96 output pin per IC.

- the more the resolution higher, the less spare space where can set IC on it in B/D. without using IC PACKAGE, we can use a BARE IC , so we can get IC with LOW COST
- because we do not solder IC on PCB directly, a soldering defect rate decrease.



Bare IC

\* 42 V6 COF is the same as 42V5.

\* composition

1) FPC + Heat /Sink

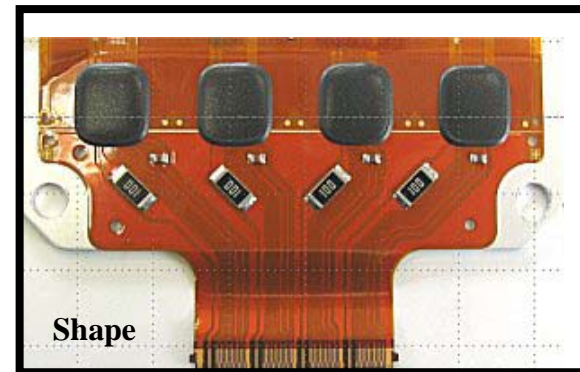
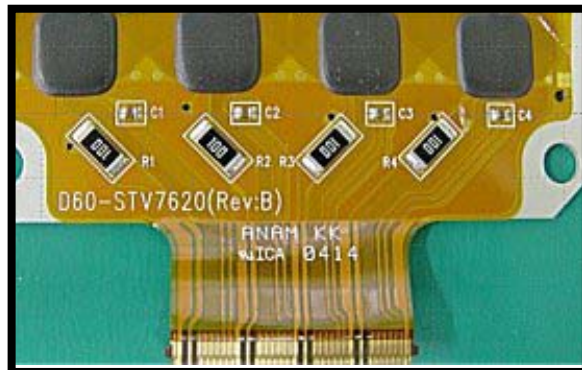
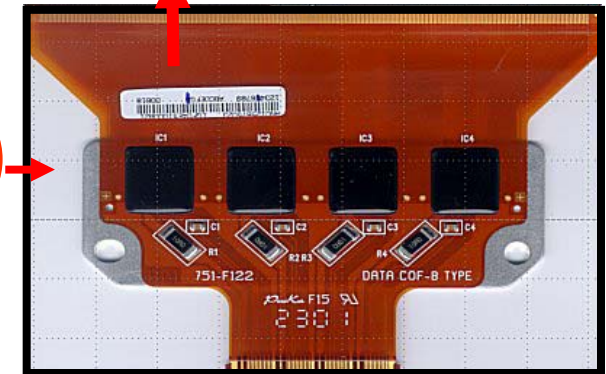
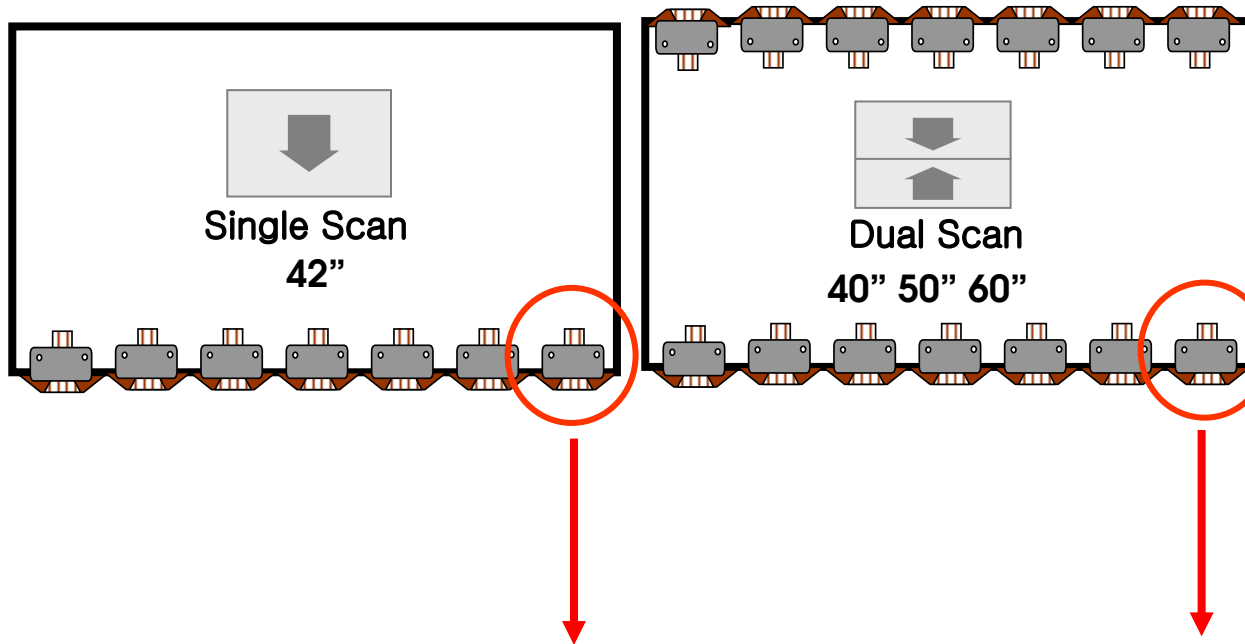
⇒ FPC for COF must have a Low Spec decline with getting damp

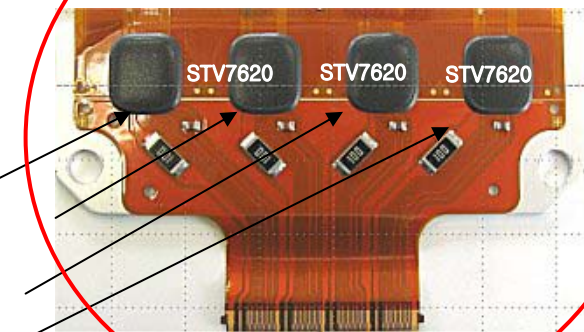
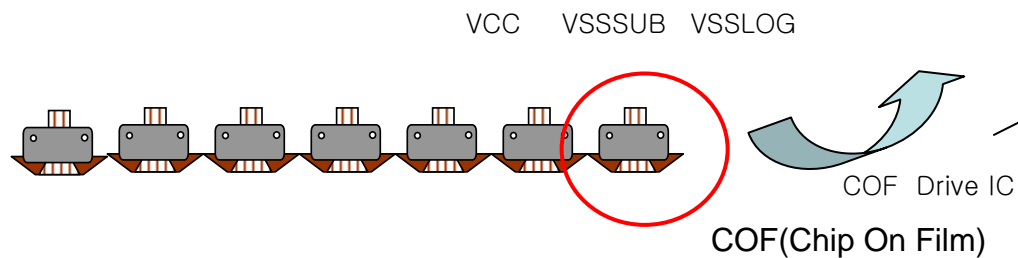
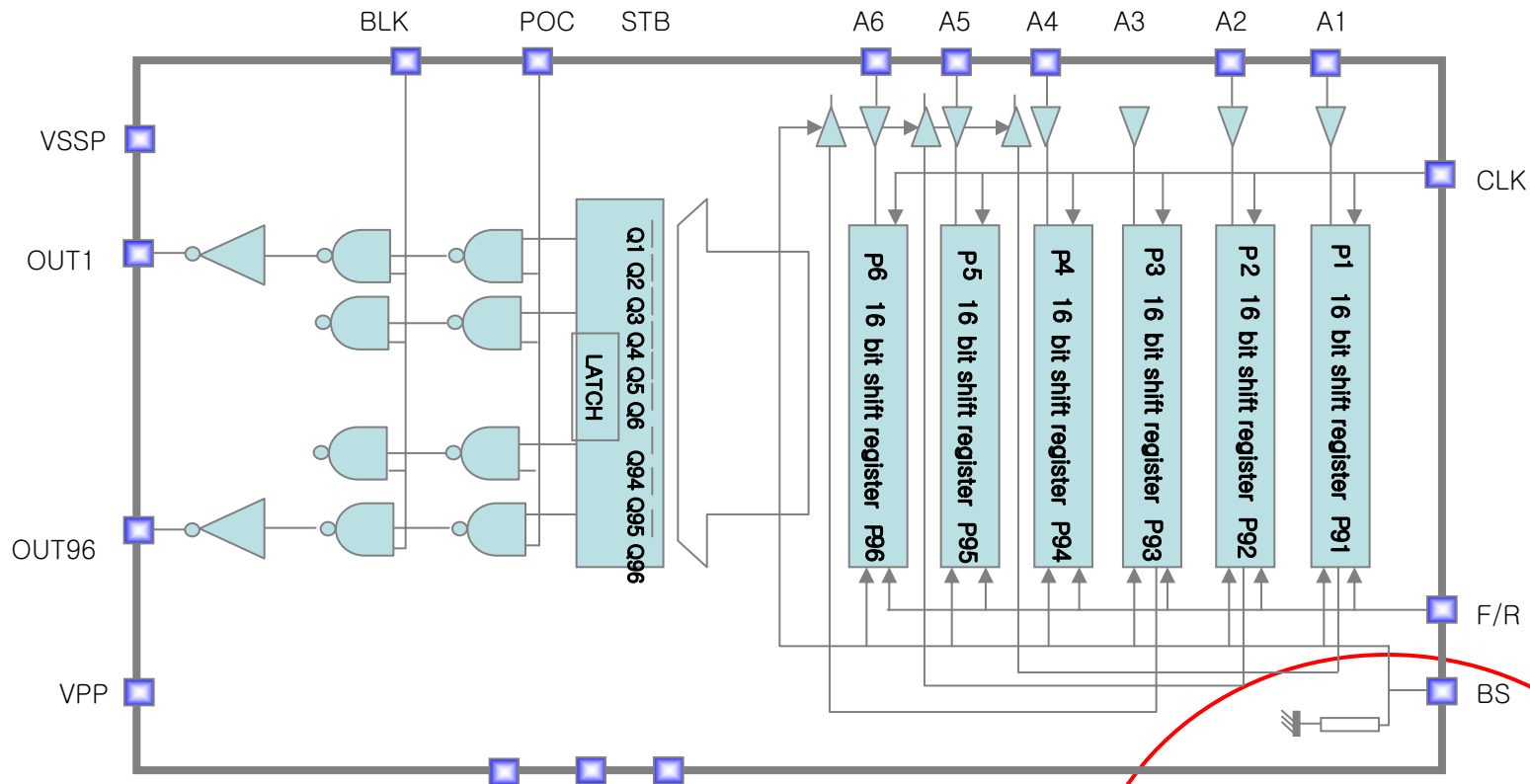
2) CHIP resistor + CHIP CAPACITOR

3) BARE IC (STV7610A/WAF) + GOLD WIRE/AL WIRE

4) EPOXY MOLDING

COF(Chip On Film) SERIAL NO.





:Composition

HEATSINK,CAPACITOR

DIODE

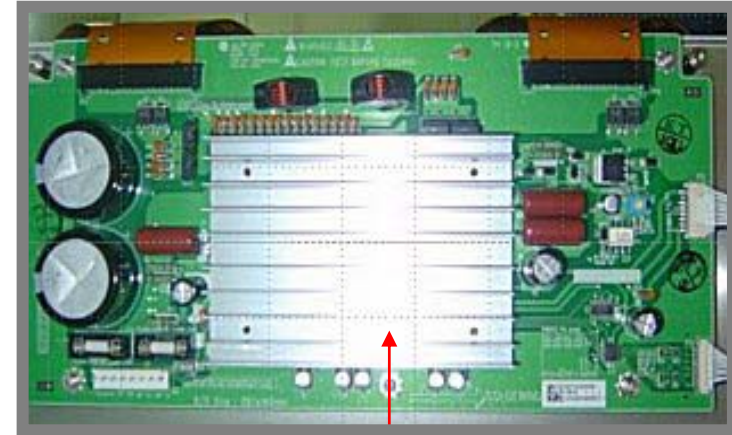
IC LINEAR

RESISTOR,TRANSISTOR,FETS.

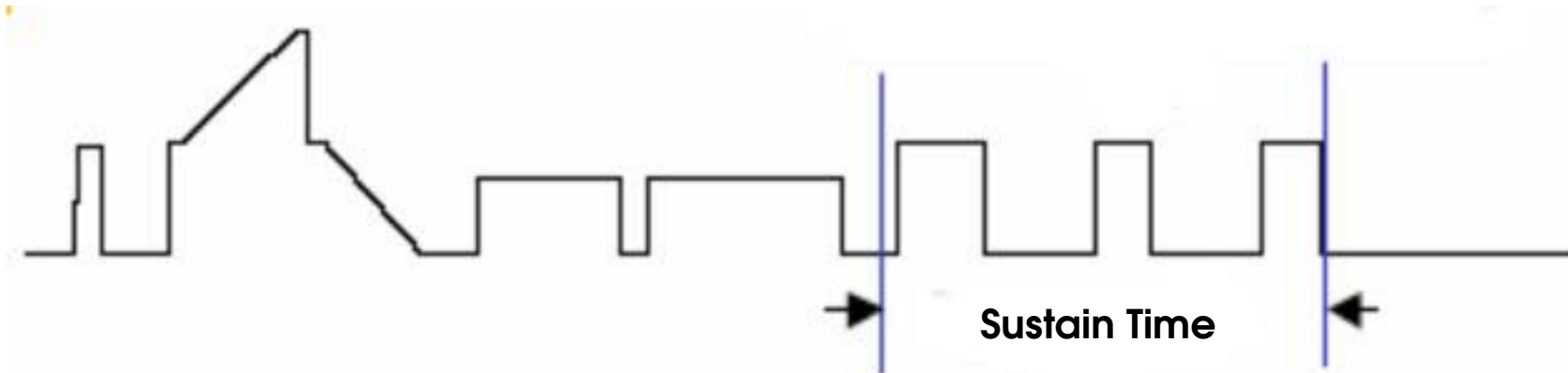
: description

Attached at Z B/D and Y B/D, make Sustain waveform.

Sustainer : supply a square wave to panel to make a video.



IPM





CTRL B/D supplies video signal to COF. So if there is a bar defect on screen,

It may be the ctrl b/d problem.

## A flow of address signal

In this figure, we can easily suppose

what will be appeared on screen when a specific part failed.

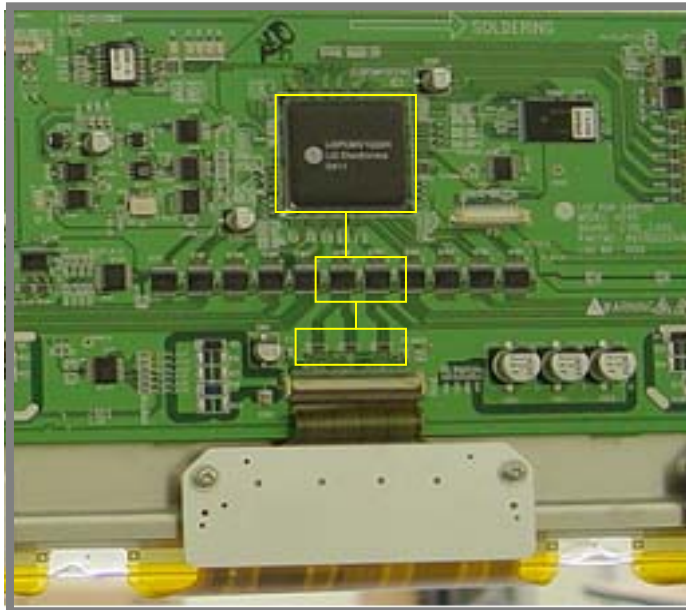
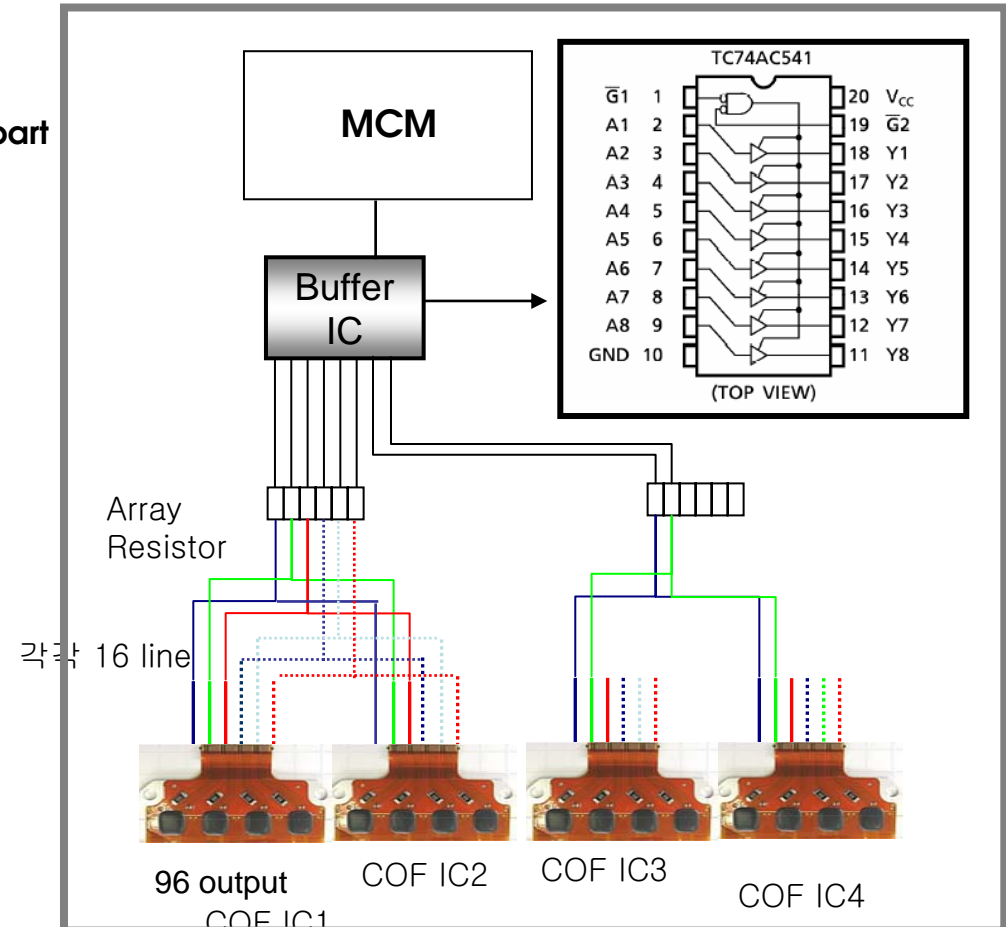


Diagram of ctrl b/d>

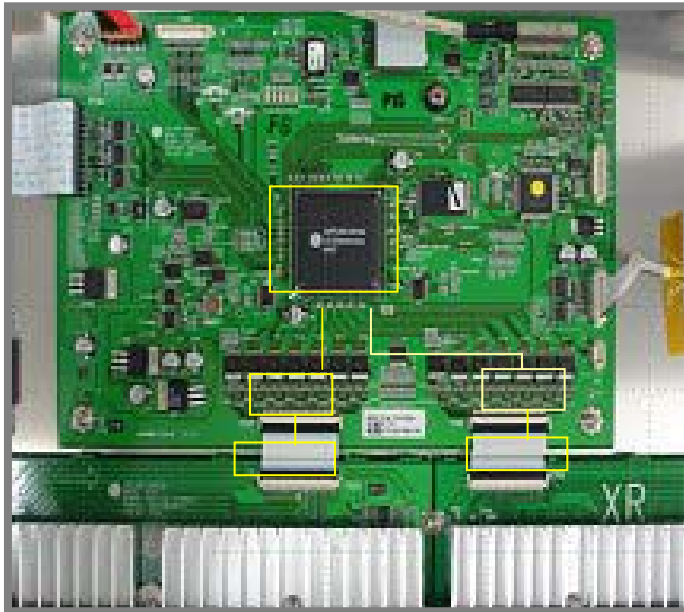




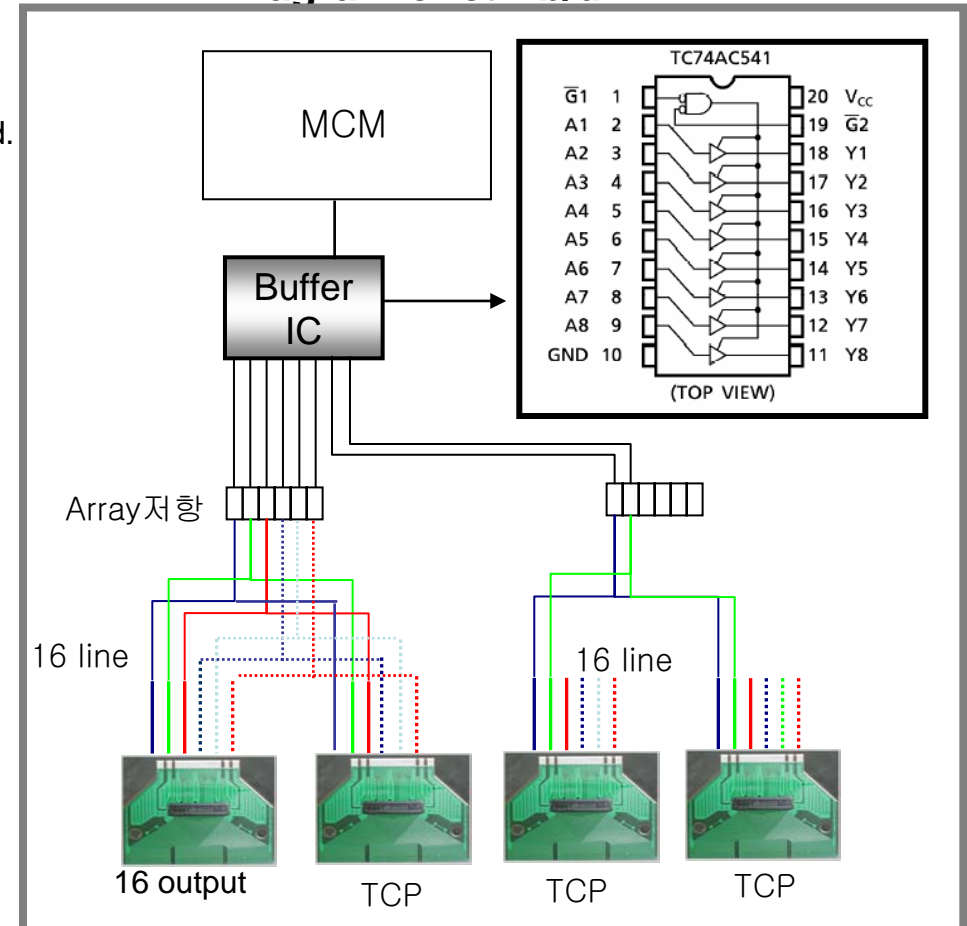
CTRL B/D supplies video signal to COF. So if there is a bar defect on screen,  
It may be the ctrl b/d problem.

## A flow of address signal

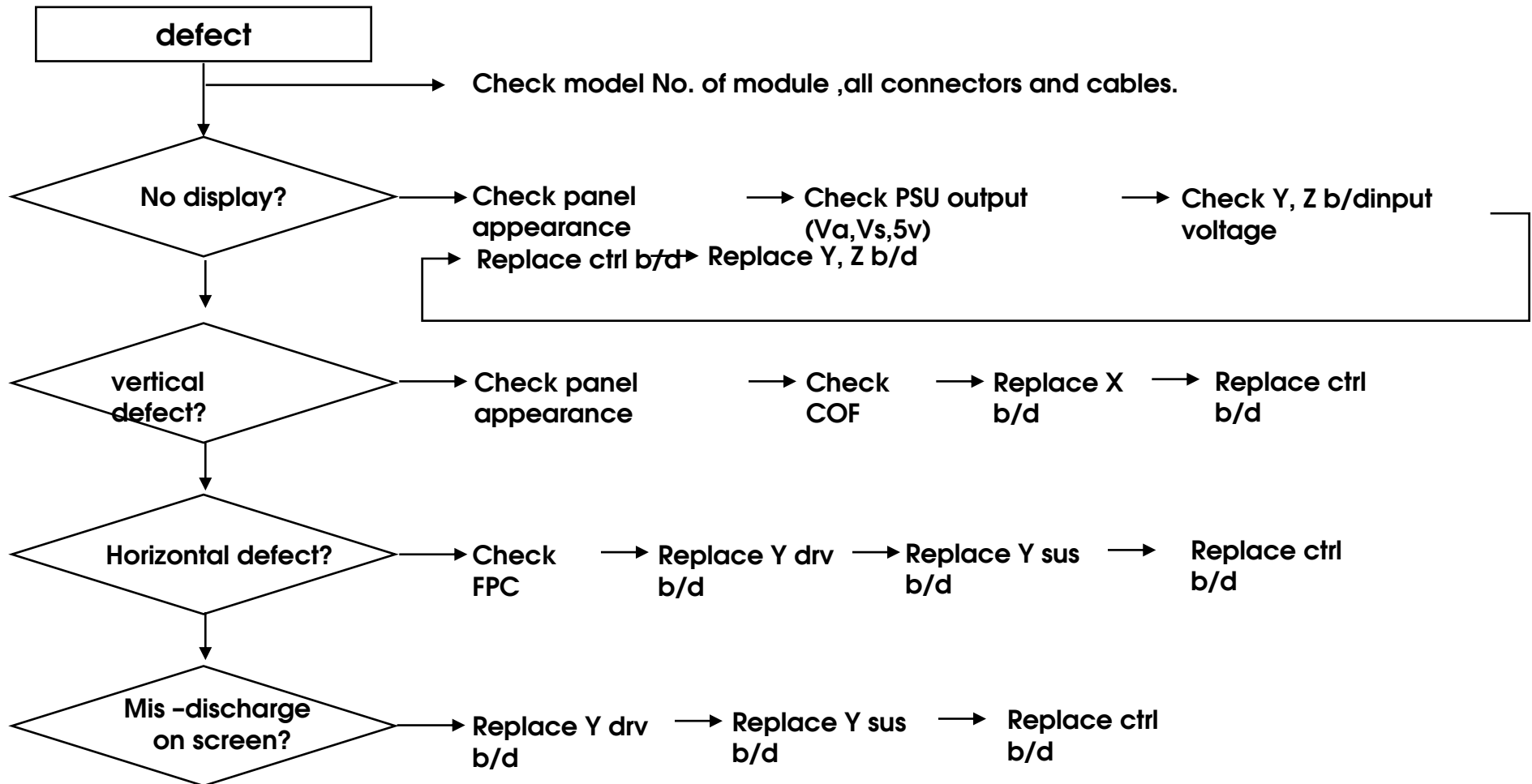
In this figure, we can easily suppose  
what will be appeared on screen when a specific part failed.



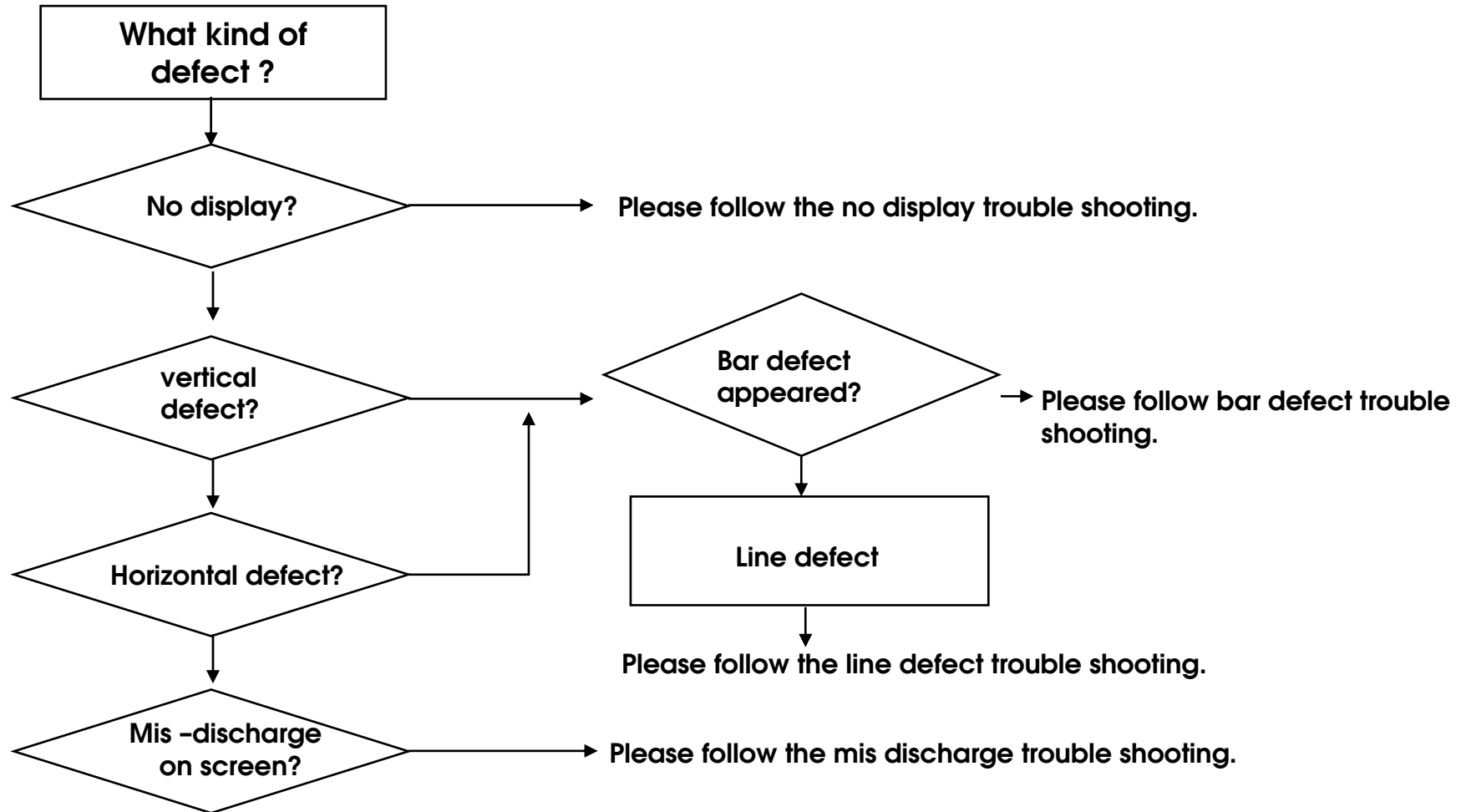
**Diagram of ctrl b/d**



## Fast check up



## Logical judgment



Check each section with following method if there is problem, replace or repair that part.

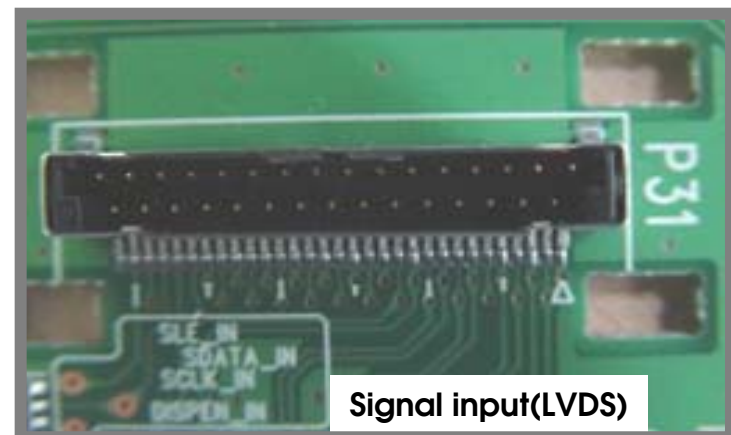
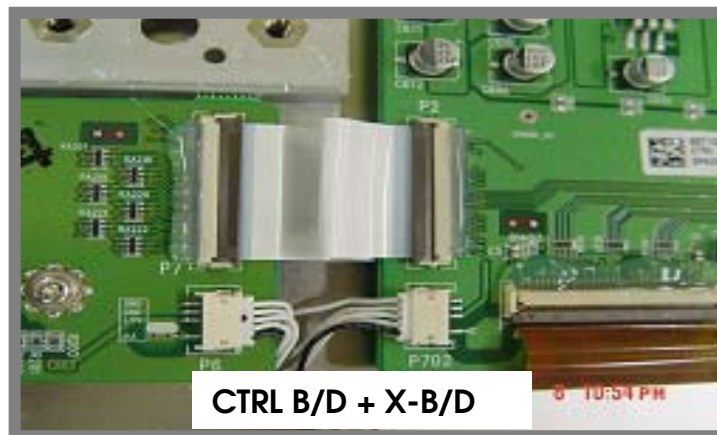
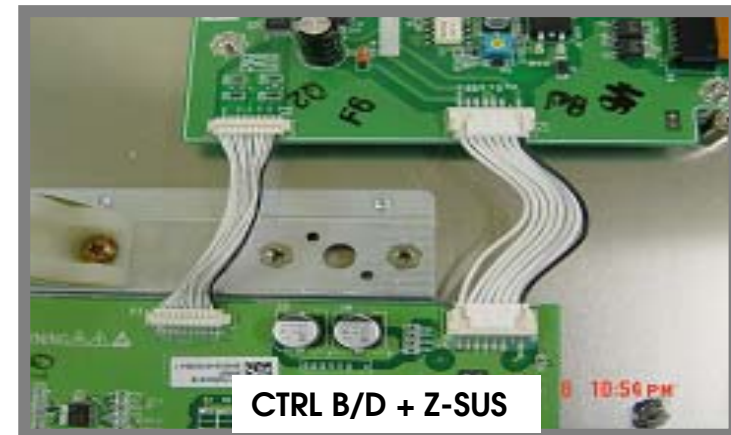
If not go to the next section.

Confirm every Connector (PSU, Y-SUS, CTRL, Z-SUS)

⇒ module may not be normal by mis-connection which can not send signal and power.

Also Mis connection for a long time has a specific b/d failed.

**No display**



Confirm exhausting Tip and find Crack with naked eyes to check vacuum state.

If there is problem replace the module .

⇒ in case of vacuum breakdown, module makes a shaking noise because of inside gas ventilation.

(there may be a small crack which could not see with naked eyes. And this noise is different from Capacitor noise. )



**NORMAL**



**CRACKED**



1. Check each unit part of PSU inside with naked eyes.

(capacitor, FET, a kind of IC, resistor)

2. Check FUSE and SW1 (on Normal).

3. Check Output voltage which is converted from AC V

to DC V.

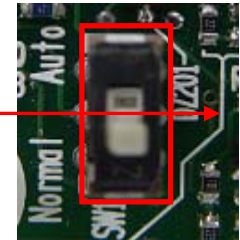
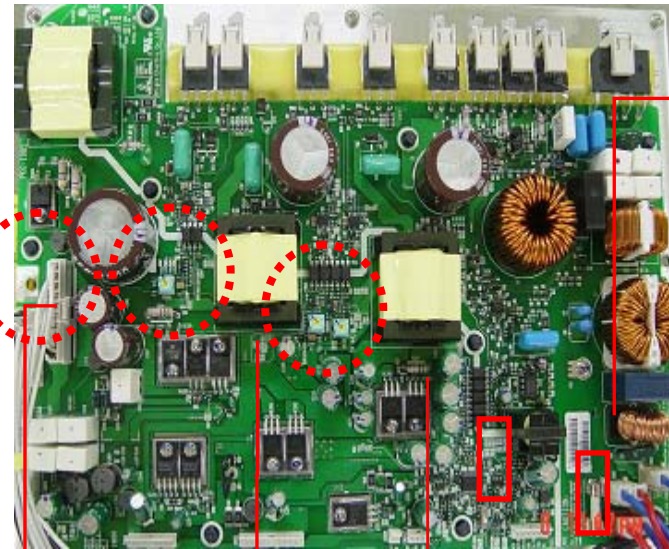
voltage Check (5V, Va, Vs)

※ When PSU Protection occurred. Check Short between Y-SUS, Z-SUS B/D .

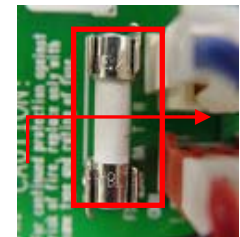
**Confirm  
input voltage**

if not same

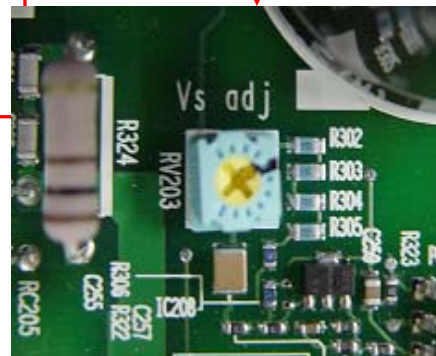
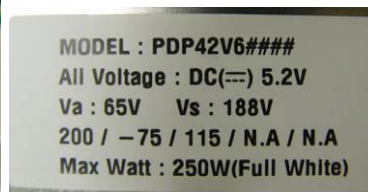
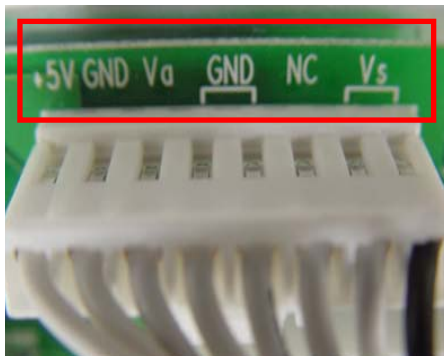
**Adjust  
voltages**



SW1 Normal



Fuse open check



Vs Voltage ADJ  
(Vs : About 180 ~195 V)



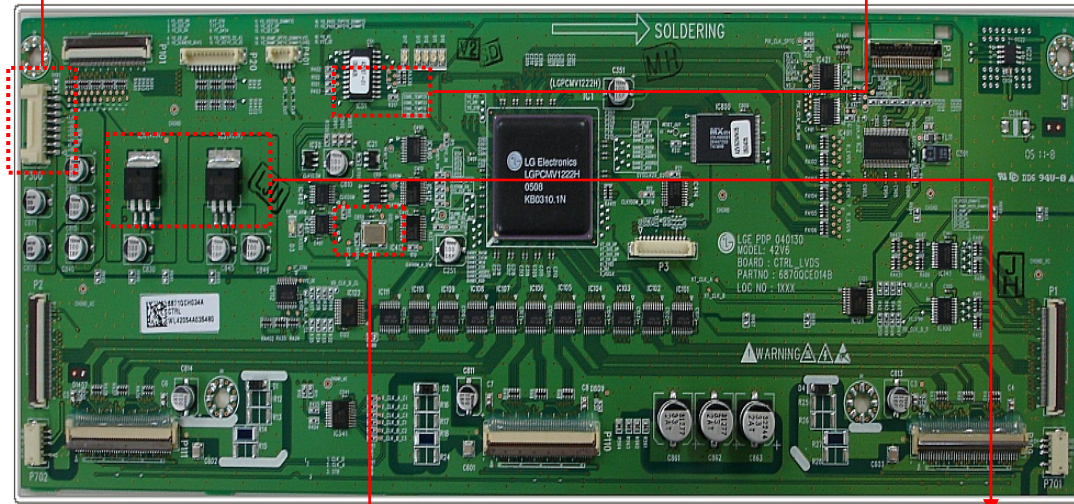
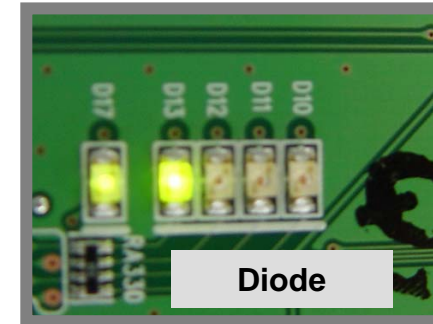
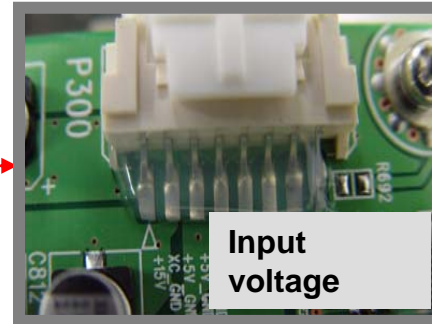
Va, 5V(VCC) Voltage ADJ  
■ Va : About 55 ~65 V  
■ 5V(VCC) : 5V~5.5V

Multi-meter Touch point

(5V, Va ,Vs must accord with Module Label)

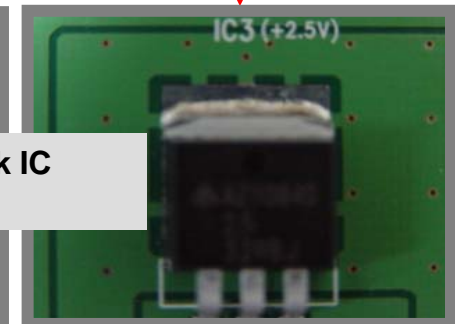
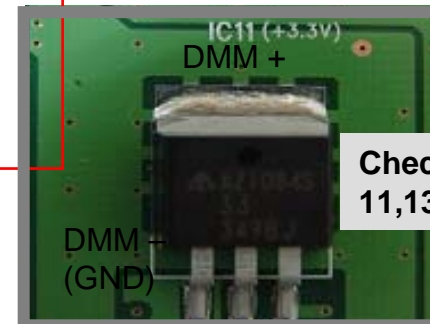
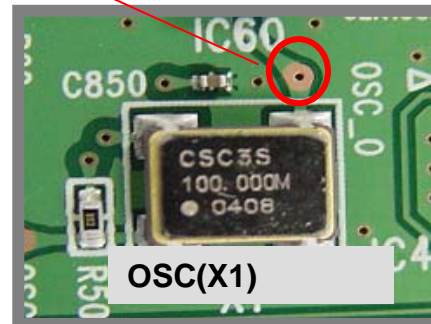


1. Confirm LED D17(flawing) ,13 lighting
2. If not CHECK OSC X1 output.
3. Check CTRL input voltage  
(CONNECTOR P300)
4. CHECK 3.3V, 5V,15V.
5. Check IC 11 3.3V  
IC 3 2.5V

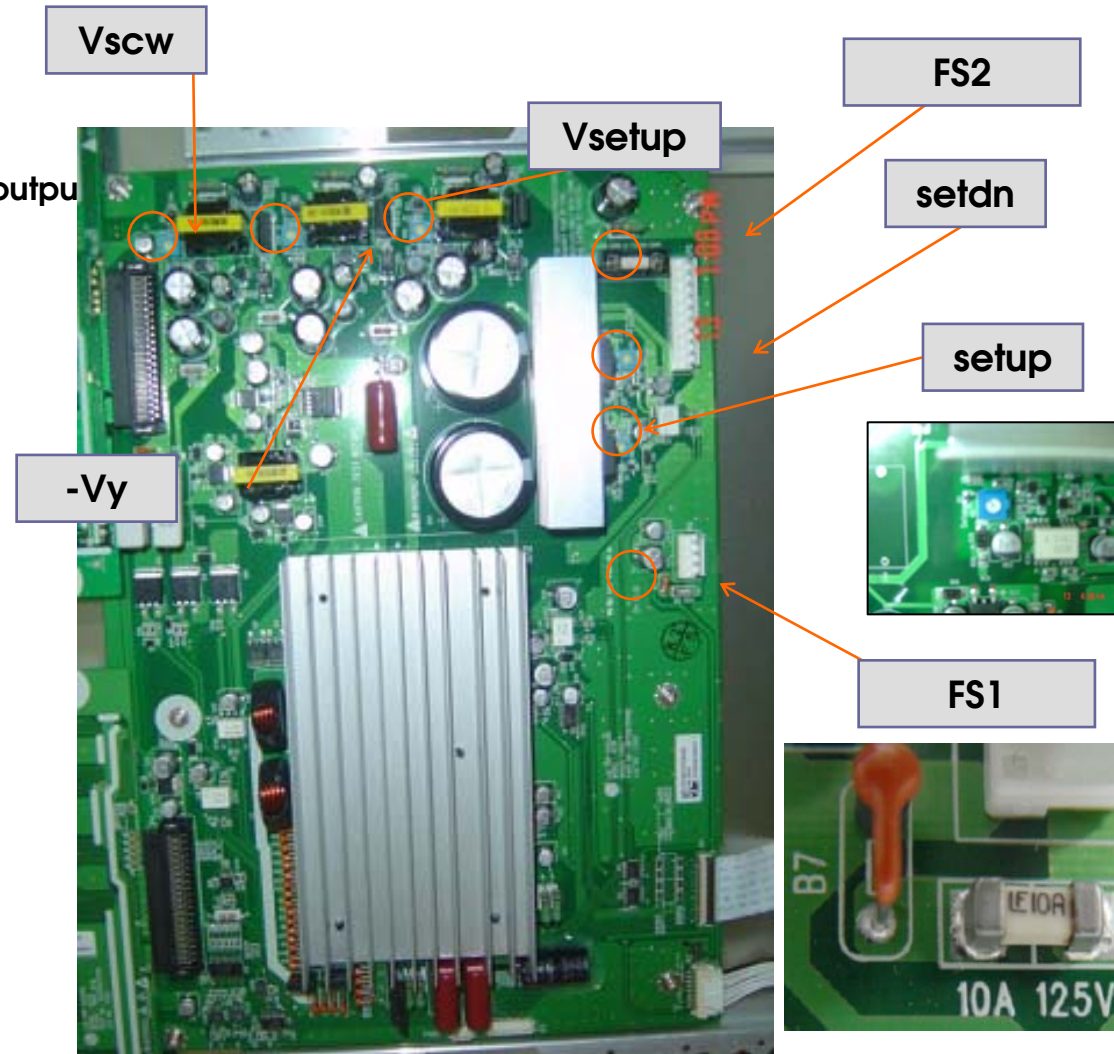


Probe  
Touching  
point

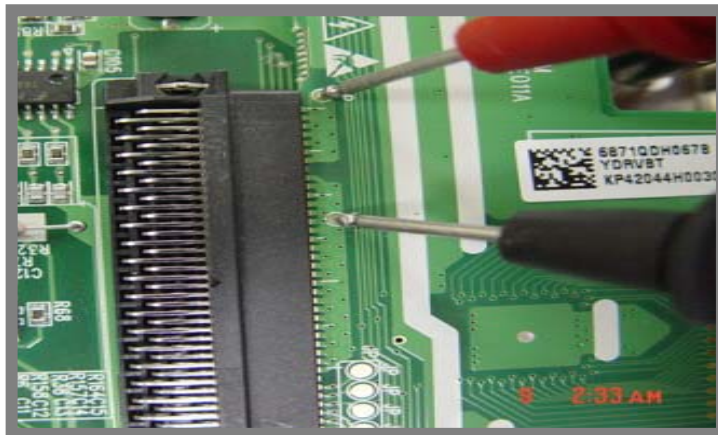
Check oscillating state.  
(normal 100 MHZ)  
Be careful with physical  
shock.



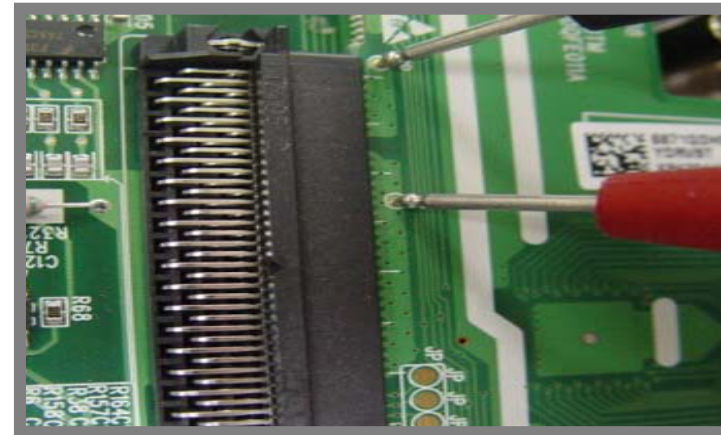
1. Check FUSE (FS1 (5v) ,FS2(Vs)).
2. Check voltages(Vsetup,-Vy, Vscw)
3. Check DIODE between GND and Y SUS output  
(SUSUP(OC2) SUSDN(OC1)).  
forward=0.4 ,reverse=OVERLOAD.
4. Check whether output voltages agrees  
with voltage that represented in label.



- Check whether output voltages agrees with voltage that represented in label.
- Check diode value GND between Y-SUS output.



**Normal diode value= 0.4  
(forward)**



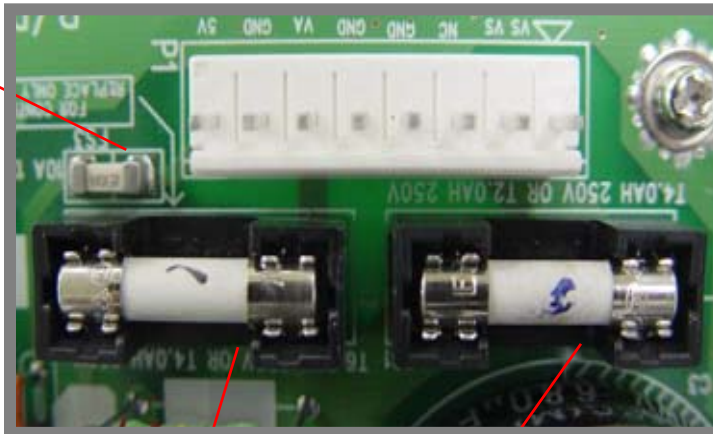
**Normal diode value = OL  
(reverse)**



1. Check the FUSE.
2. Check input voltages.(Va, 5V,15V)
3. Check FPC out put diode value.
4. Check ramp waveform.

### ■ Check the FUSE

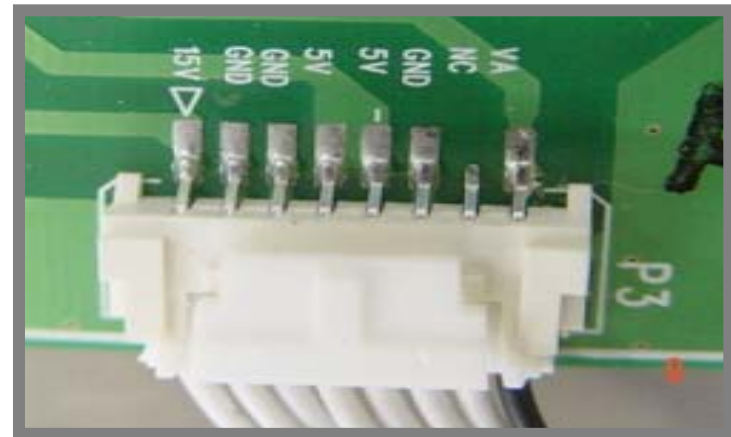
5V FUSE



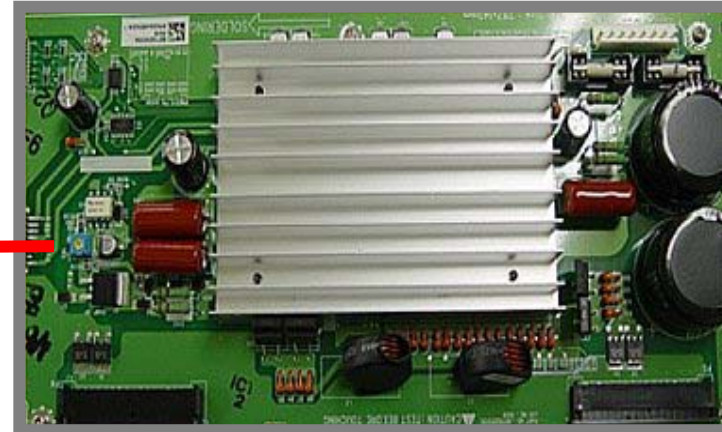
Va FUSE 6.3V

Vs FUSE 6.3A

### ■ Check input voltages

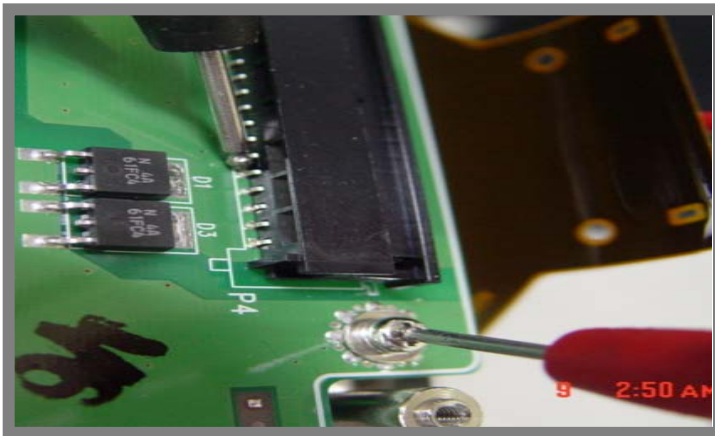


- Variable resistance of Z RAMP waveform slope.

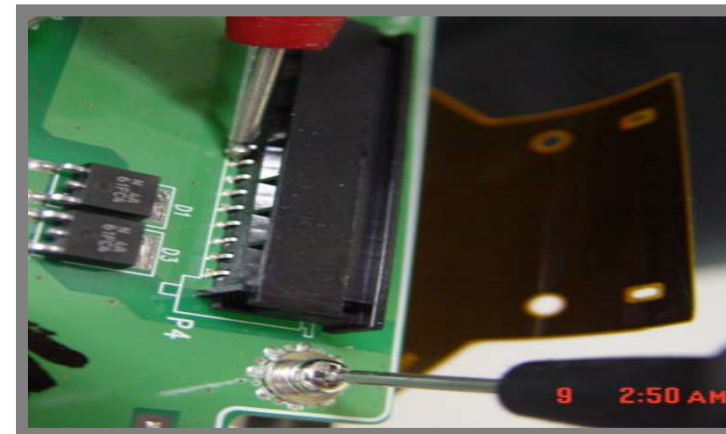


- Check FPC output diode value.

caution: check certainly after removing FPC.



Normal diode  
value=0.375(forward)



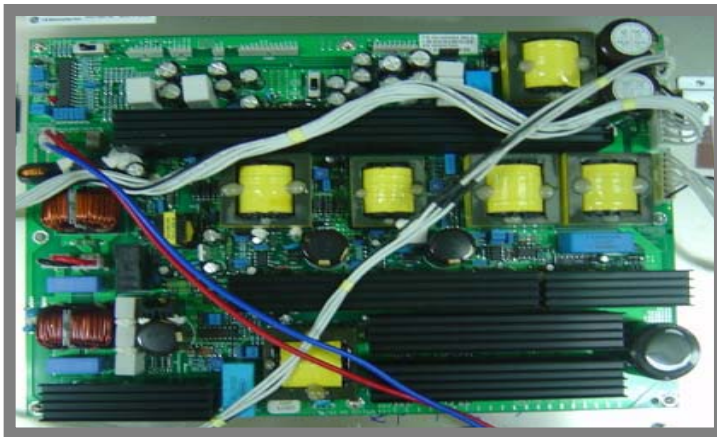
Normal diode value=OVER  
LOAD(reverse)

It is power protection when power is off automatically within 2~3 min. from power on.

Power protection function protect the boards when occurred short on circuits of PDP module or power problem.

If can not impress power even after replacing PSU, find out where the short occurred.

\* PSU makers.



DAEGIL PSU



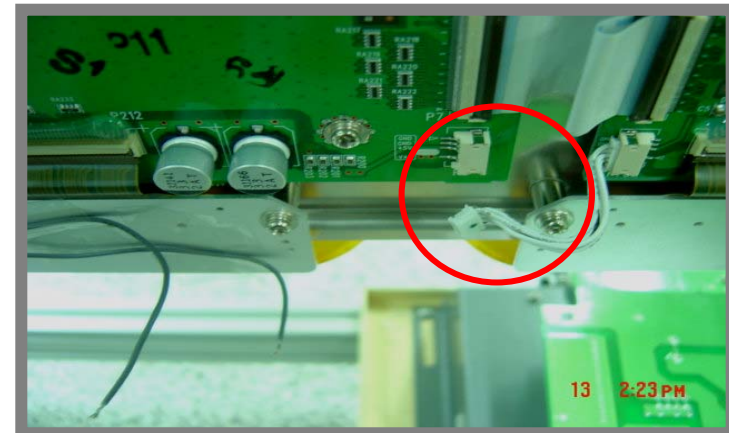
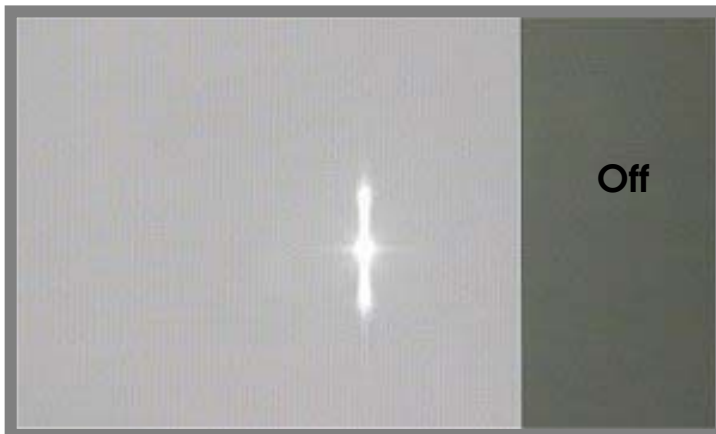
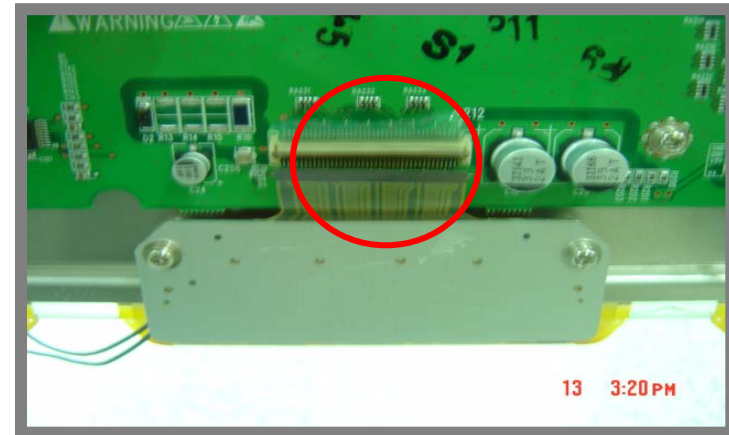
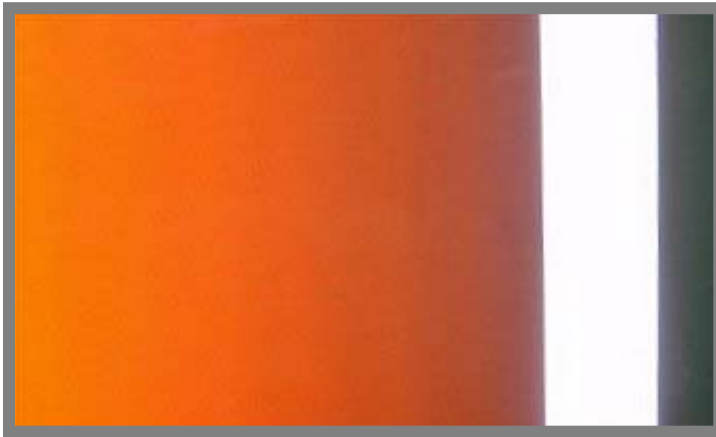
ORIGIN PSU



Check each section with following method if there is problem, replace or repair that part. If not go to the next section.

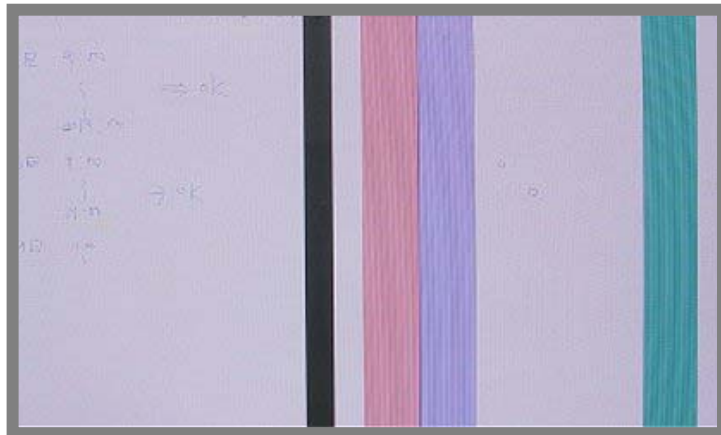
## Connector

Check COF connector. If not connected well, it will Make a bar defect .

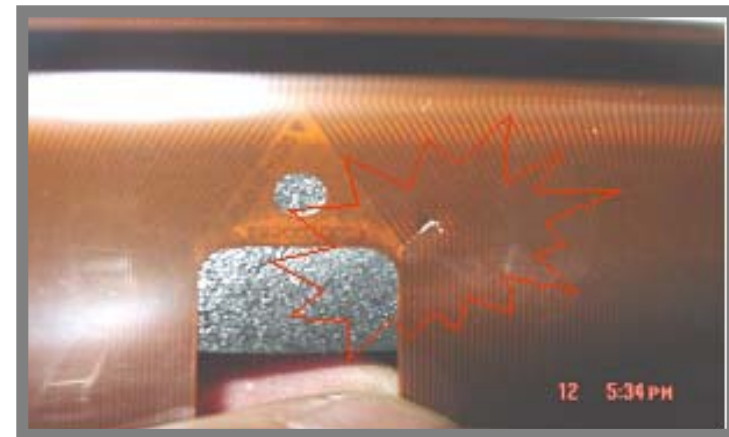


## Checking COF

Confirm whether COF was torn. And then check input of COF resistor and IC.



COF 6 is torn partly



Tearing

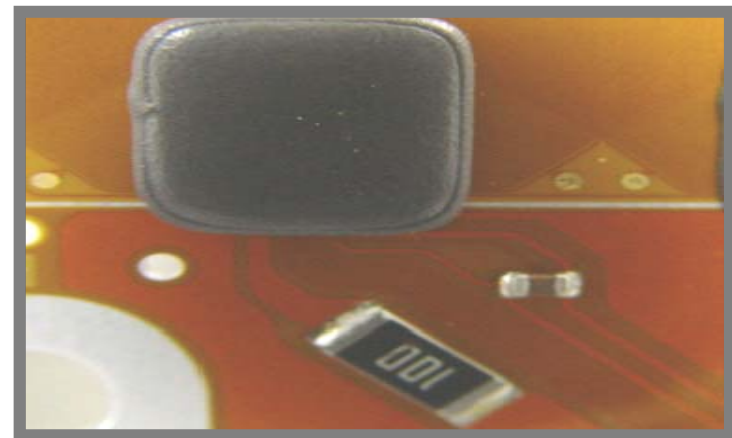
## ◎ Checking address COF input of resistor and IC

### ■ COF resistor checking

Check the both side of resistor With Digital multi meter(DMM) .

If the resistor is normal, the resistor value will be  $10.2 \sim 10.8 \Omega$

But if not, the value will be 0 or infinity and replace the resistor.



## © Checking address COF input of resistor and IC

### ■ IC input checking

Inside of IC , there is 4 ea diodes which separated in 2 series .

(input 2, output 2)

\*how to check

1.contact DMM - terminal to a right terminal of condenser(GND)

and DMM + terminal to a right terminal of IC, normal value 0.66 (fig.1)

2.contact DMM - terminal to Output terminal of resistor, and

DMM + terminal to a right terminal of IC , normal value 0.73 (fig.2)

Fig. 1

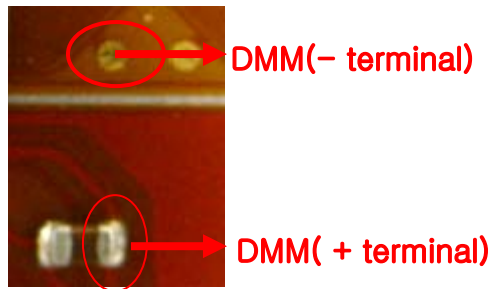
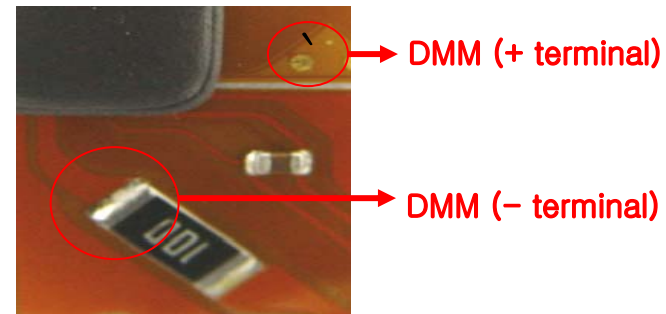


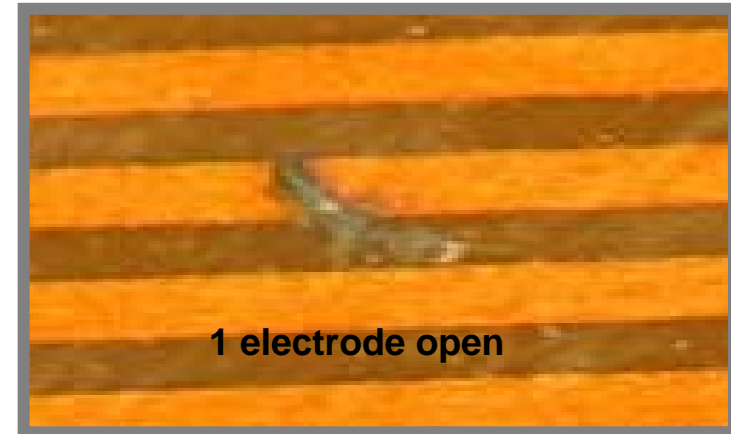
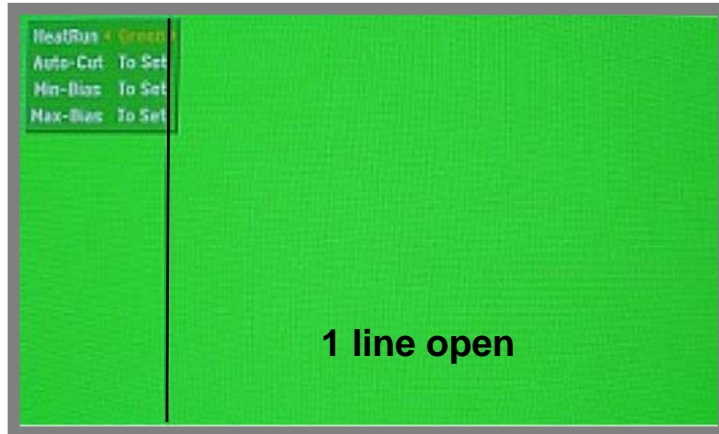
Fig. 2



In case of 1 line open or short , check foreign substances in COF connector. First blow up foreign substances with your mouth. And then if the same line appears, replace the panel.

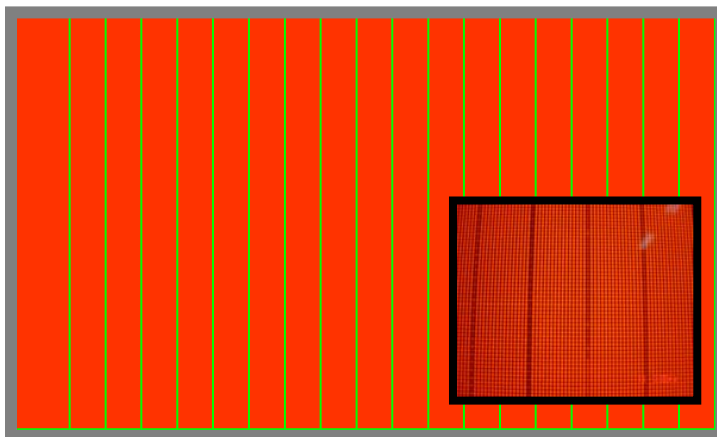
### Line open or short

This phenomenon is due to COF IC inside short or adherence part of the Film and rear panel electrode problem.  
In this case, replace the panel.



### Line open or short with same distance.

This is MCM of Ctrl b/d defect. MCM can not be replaced separately. So replace the ctrl b/d.





- **Case 1: Buffer IC fail**

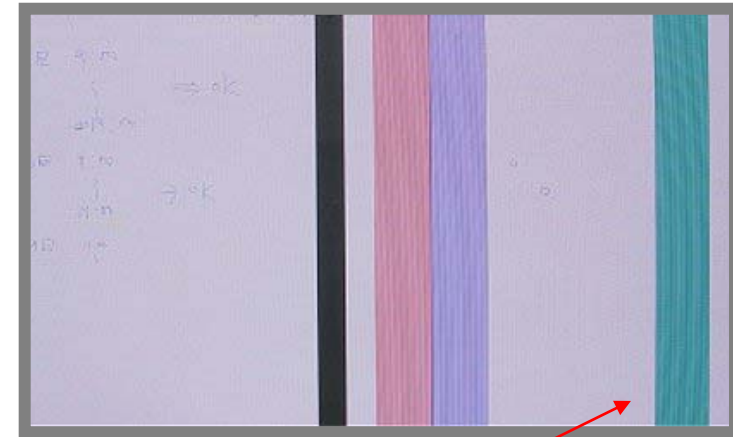
COF IC 1,2  $\Rightarrow$  192 line(96+96) open.

COF IC 3,4  $\Rightarrow$  64 line open

(with fixed interval there is on,off ..... Repetition)

- **case 2 : Array resistor fail**

COF IC1  $\Rightarrow$  16 line , COF IC2  $\Rightarrow$  16 line open

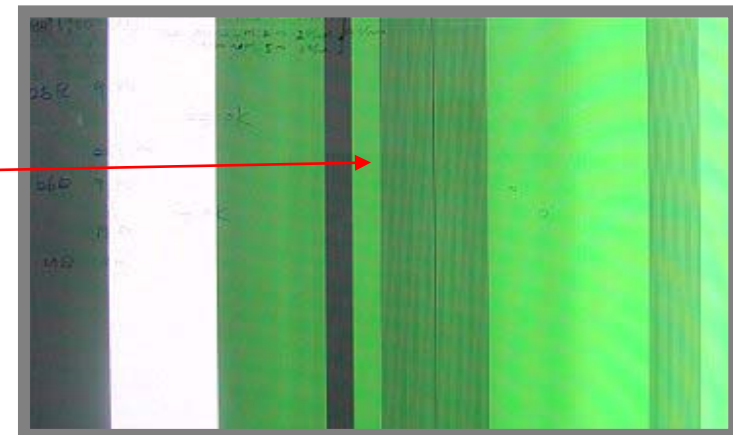


16 line open

- **case3 : COF IC fail**

96 line open.

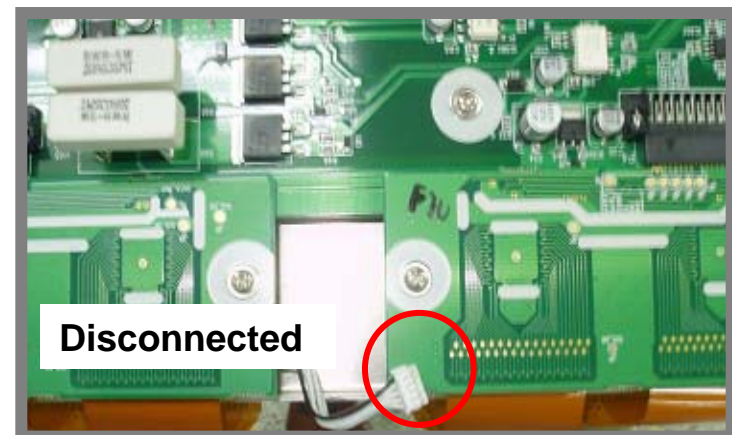
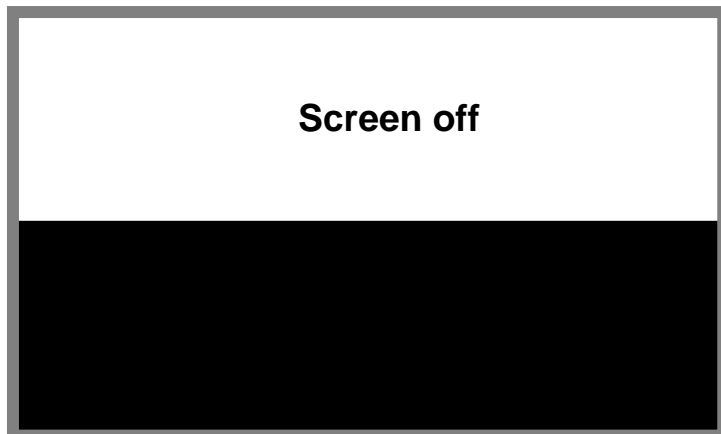
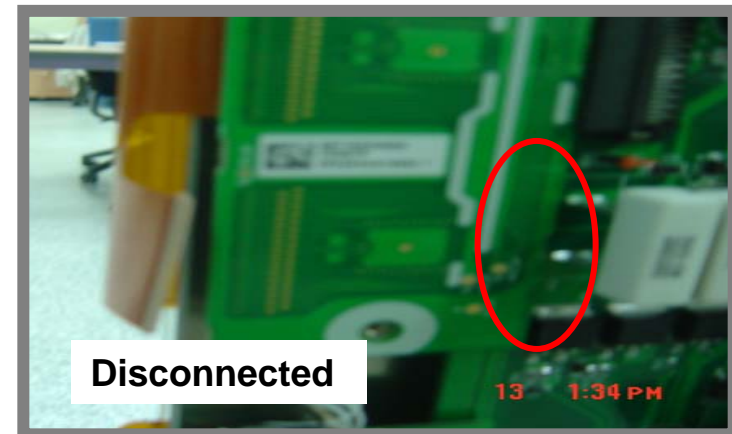
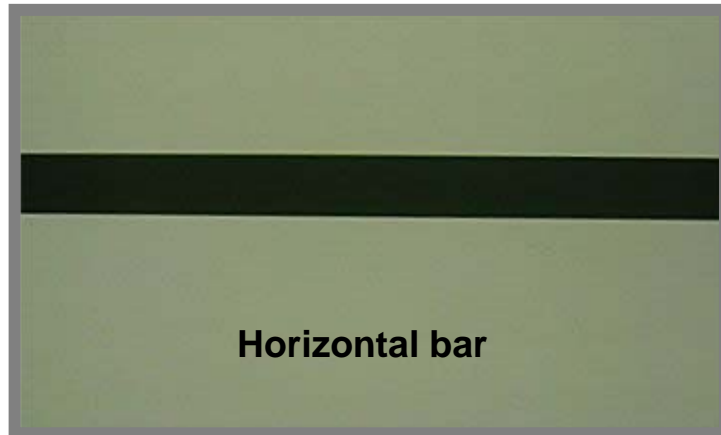
96 line open



Most horizontal defects can be repaired. In case of adherence part of the Film and rear panel electrode defect or panel electrode open, short, replace the panel.

## Connector

It can make a horizontal bar that connector on Y b/d and Z b/d did not plugged well. Because sustain voltage can not be supplied to panel. So check connectors (FPC, Y drv -Y drv) first.



Check diode value of the right side part of output pin.

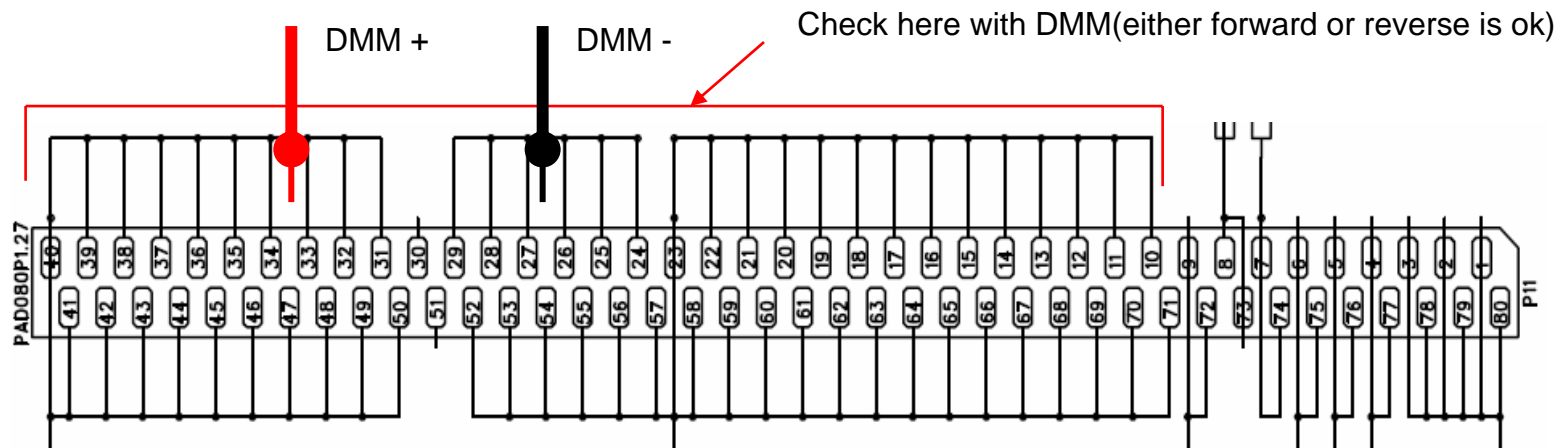


Normal diode value. (in case of Panasonic IC=1.035)



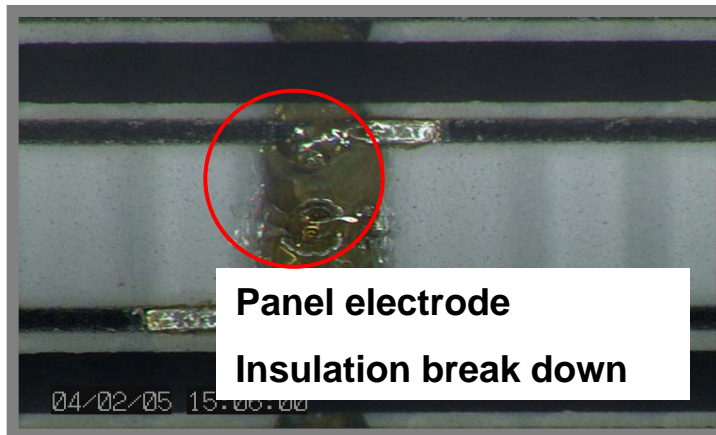
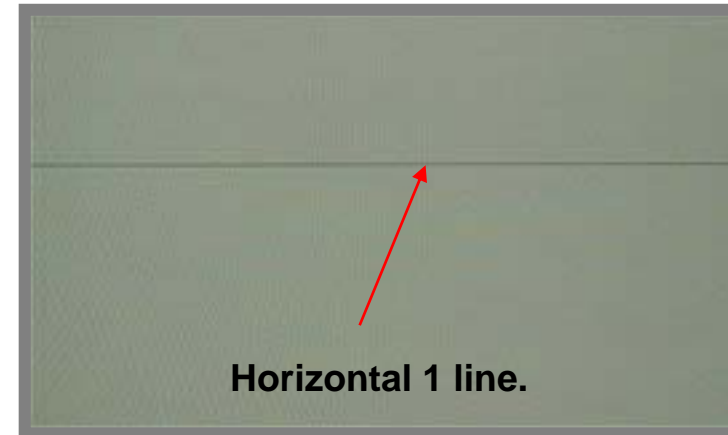
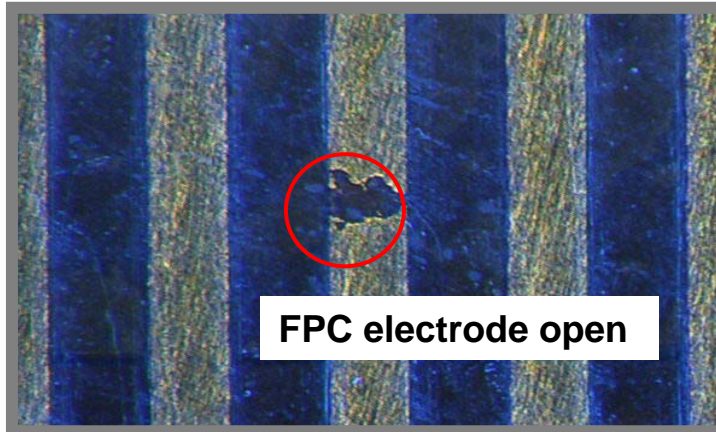
Defect diode value= 0.018

\* It can be different from each IC Maker. (in case of TI IC= 0.6~0.7)



## Check FPC

In case of horizontal 1 or more line, it is due to FPC or panel inside . ctrl b/d, Y b/d is just normal.



## Check scan IC

Check with same method that presented in Horizontal (bar).

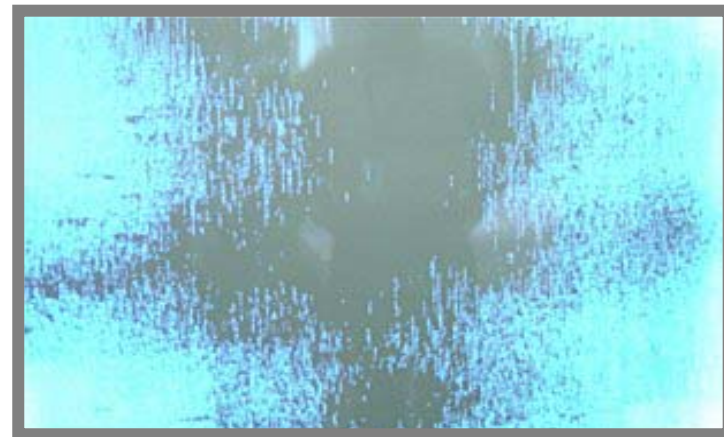
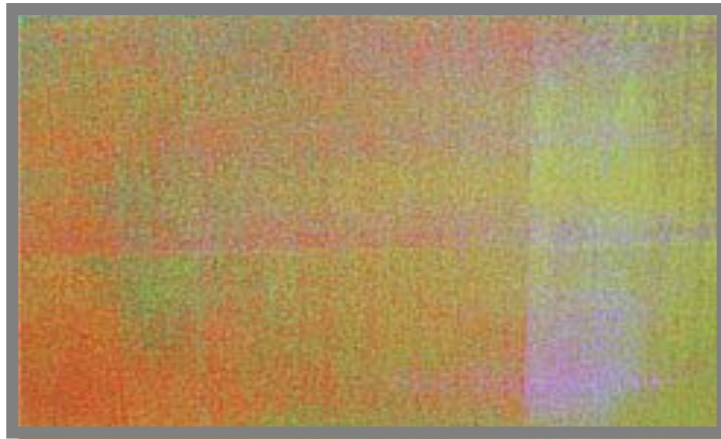
Most of mis-discharge appearance is problem of y drv ,y ,z b/d.check these boards when occurred.

## Checking order

1. Confirm Y, Z SUS signal cable.
2. Check Y DRV IC FAIL
3. Check Y sus b/d voltages( $-V_y$ . $V_{scw}$ )
4. Check Y ,Z-SUS IPM fail
5. Replace CTRL b/d

---

### \*Mis-discharge





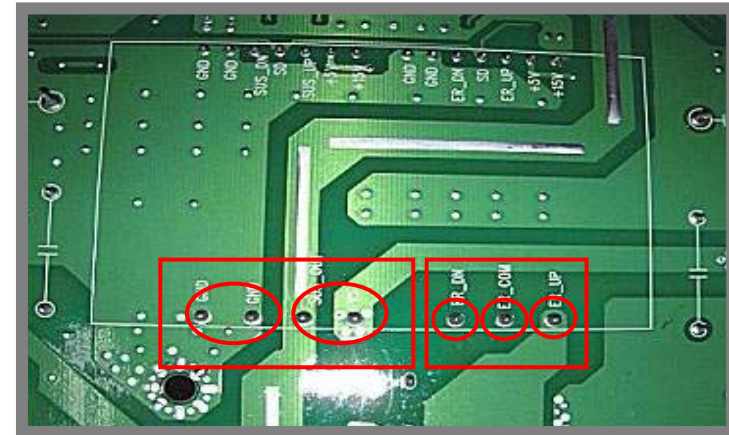
## © How to check IPM

Forward : test 1 GND(+) , Sus-out(-)  
 2 Sus-out(+),Vs(-)  
 3 ER-DN(-),ER-COM(+)  
 4 ER-COM(-),ER-UP(+)

when each 4 TEST Diode value is over 0.4V => **OK**

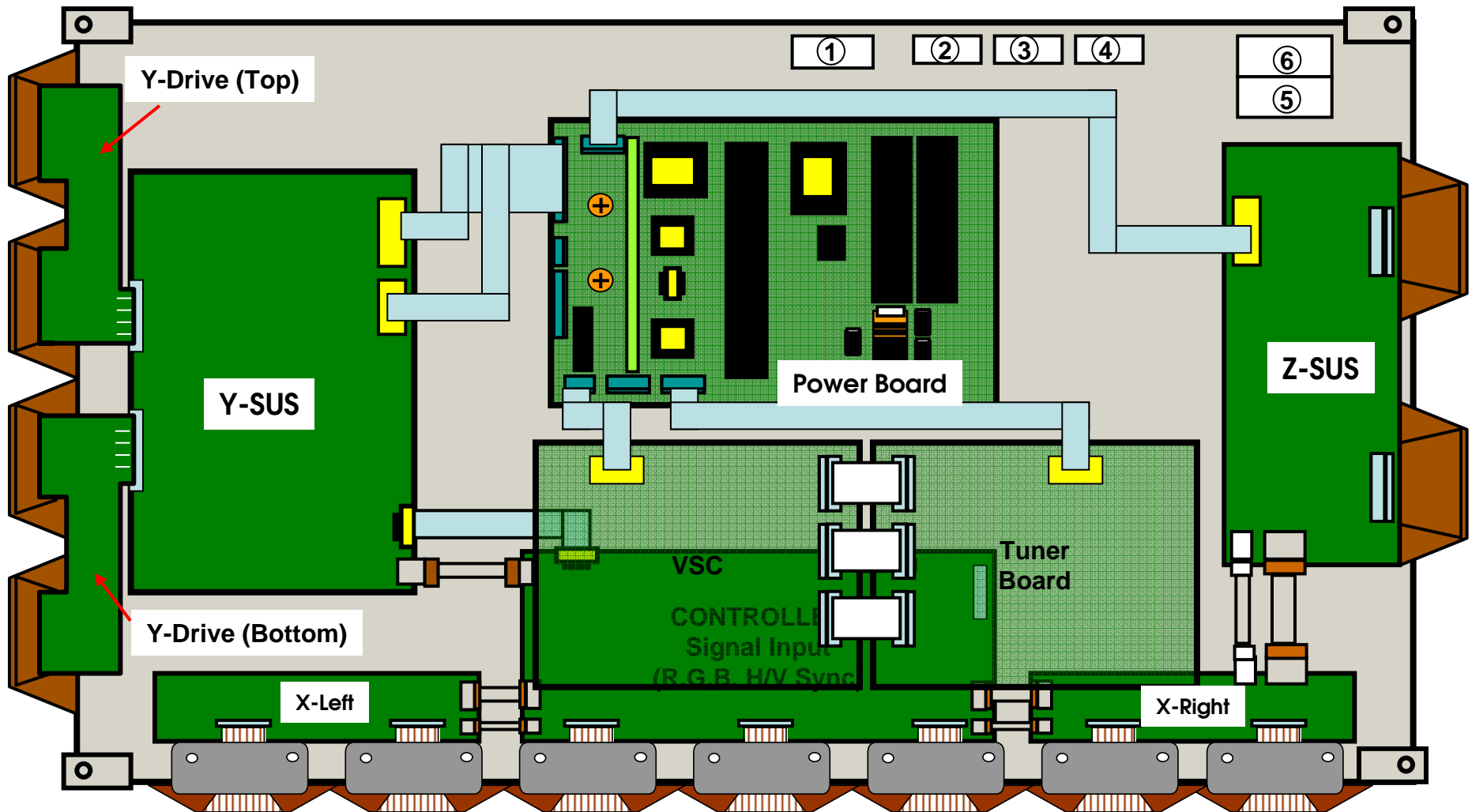
Reverse : test 1 GND(-) , Sus-out(+)  
 2 Sus-out(-),Vs(+)  
 3 ER-DN(+),ER-COM(-)  
 4 ER-COM(+),ER-UP(-)

when each 4 nodes TEST Diode value is infinity => **OK**



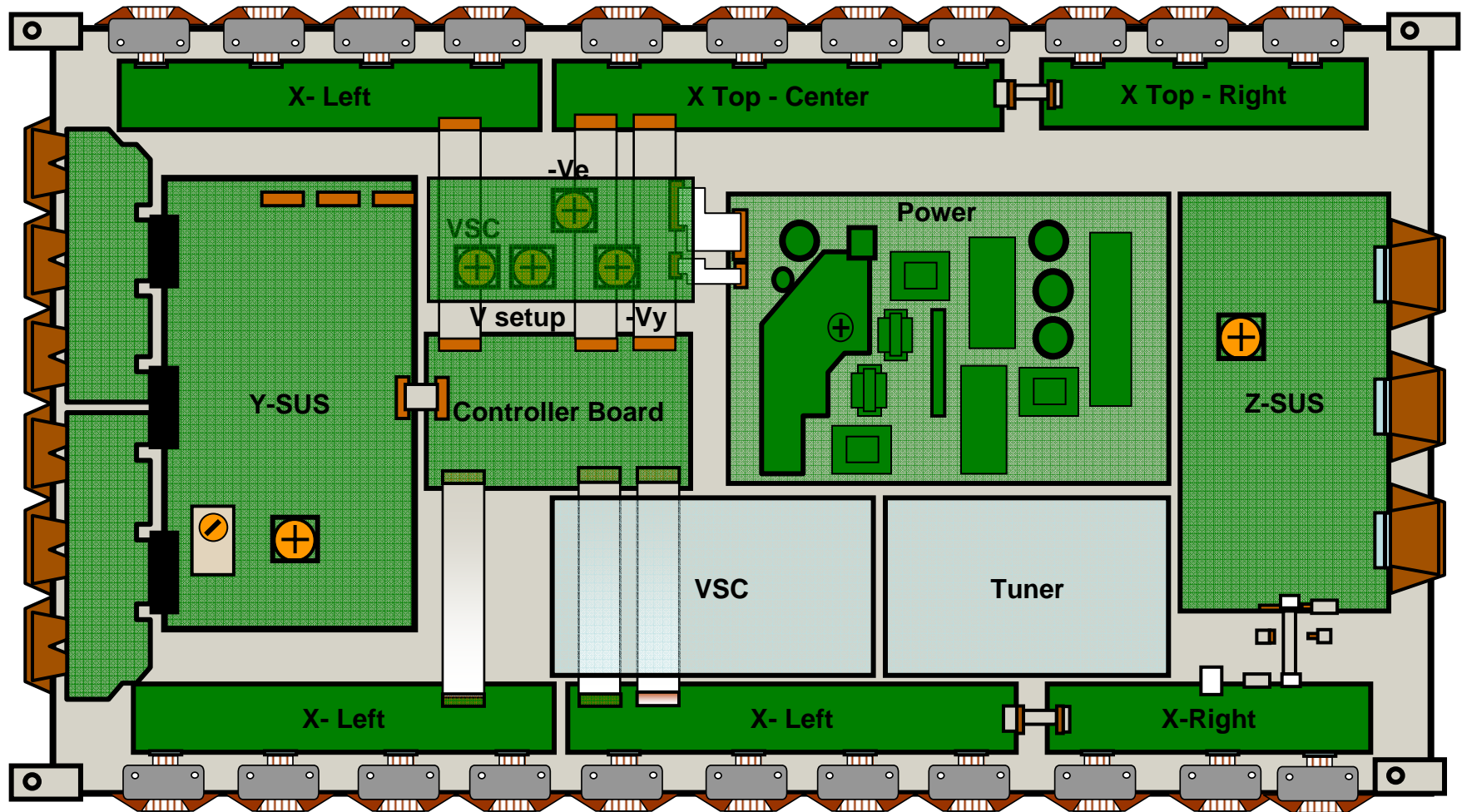
- ※ Specially, the value of ER-UP,COM,DN in the Y/Z board, should be checked all of them. but, the terminal of Vs,Sus-out,GND, we must aware to know after check one of IPM because it is parallel.
- if no problems, check 15V(Y,Z B/D) with GND, → Forward value 0.3V, Reverse value infinite. If no problems,

## Hurricane Module (42" VGA)

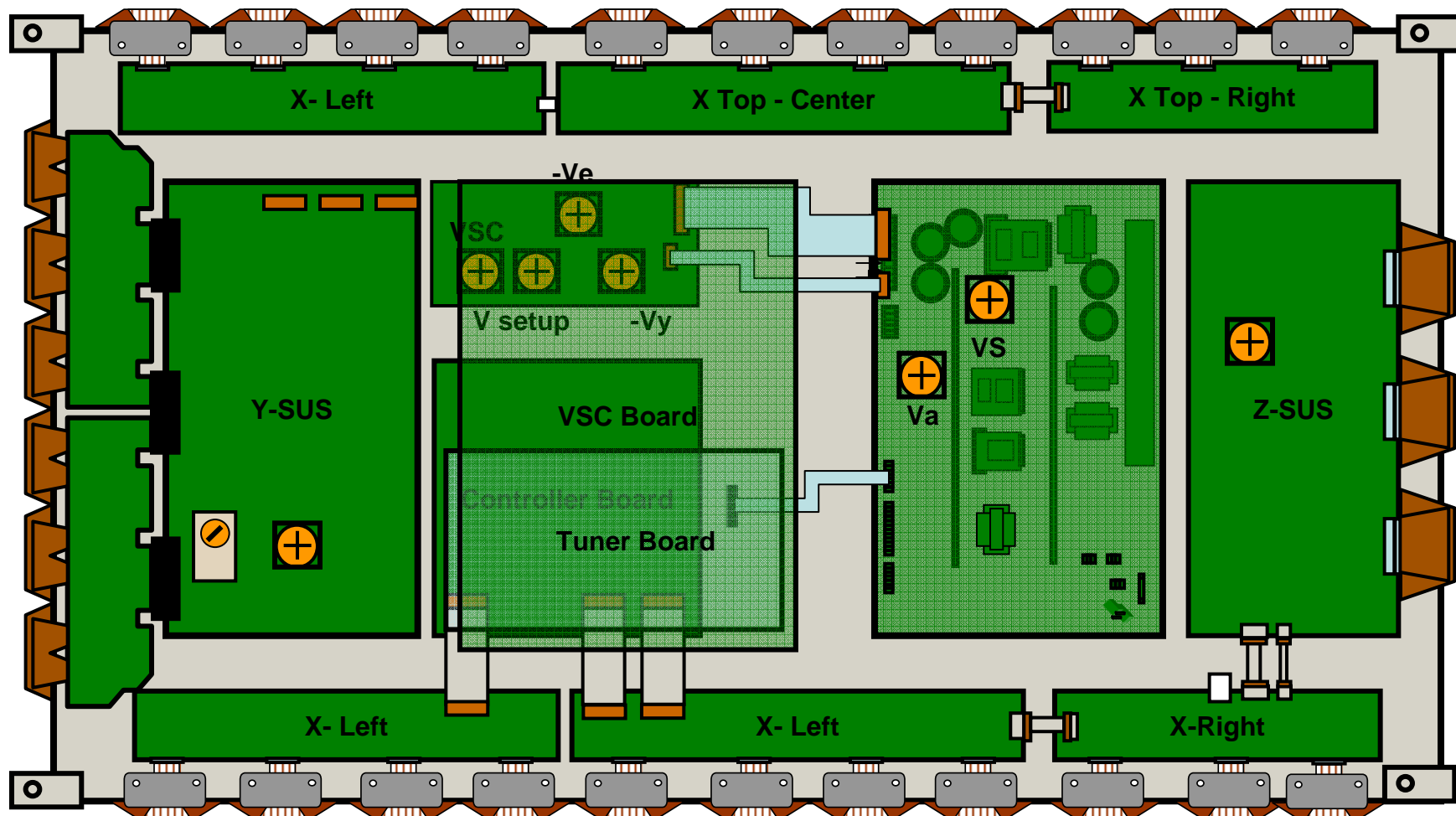


**X CUTE 125**

## Hurricane Module (50" XGA)

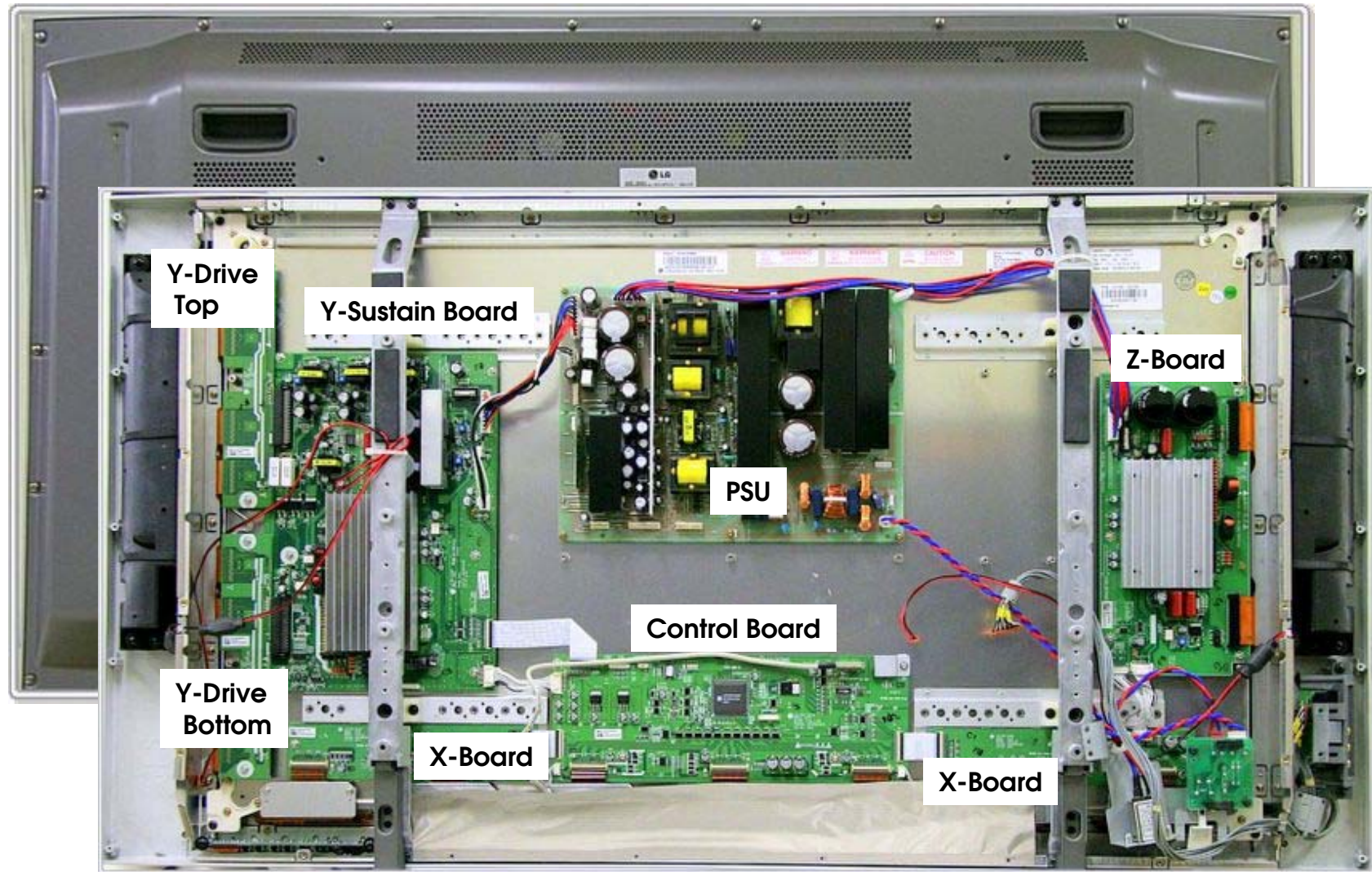


## KK Module (50")





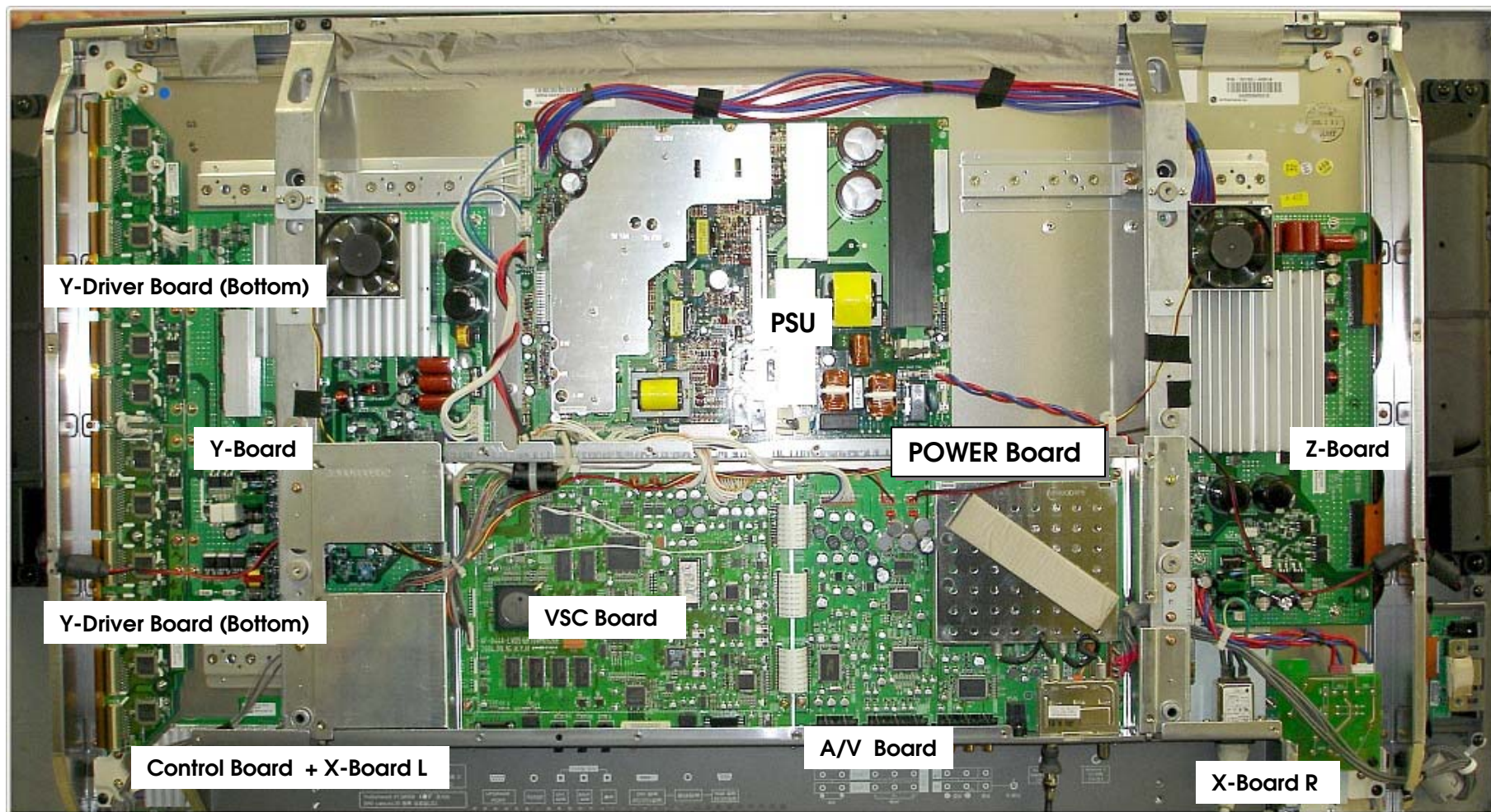
## 42" VGA (V6 Module)





## General type

42" XGA



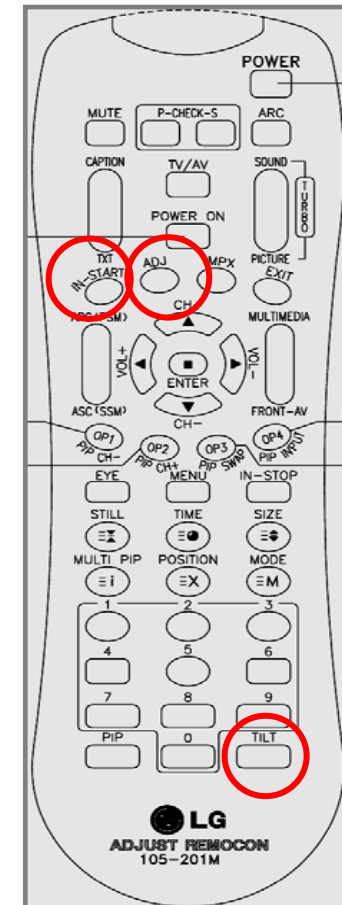
White-Pattern  
1. Test Pattern ◀ Off ▶

White-Pattern  
1. Test Pattern ◀ W ▶

White-Pattern  
1. Test Pattern ◀ R ▶

White-Pattern  
1. Test Pattern ◀ G ▶

White-Pattern  
1. Test Pattern ◀ B ▶



## Display Message

## Explain

PowerOffStatus	
1. POWOFFMOD_KEY	0xe0
2. POWOFFMOD_INSTOP	0xdf
3. POWOFFMOD_INSTOP	0xdf
4. POWOFFMOD_INSTOP	0xdf
5. POWOFFMOD_INSTOP	0xdf
6. POWOFFMOD_INSTOP	0xdf
7. POWOFFMOD_INSTOP	0xdf
8. POWOFFMOD_INSTOP	0xdf
9. POWOFFMOD_INSTOP	0xdf
10. POWOFFMOD_INSTOP	0xdf

POWOFFMOD_CPUCMD	From CPU Power Off
POWOFFMOD_ABN	Abnormal Off
POWOFFMOD_KEYTIMEOUT	Power Off Key 에 대한 CPU 응답이 없음
POWOFFMOD_ACDET	AC Detect Error
POWOFFMOD_RESET	Main Power Off
POWOFFMOD_5VMNT	5V Error
POWOFFMOD_KEY	Power Key Input
POWOFFMOD_OFFTIMER	Off time Off Mode
POWOFFMOD_SLEEPTIMER	Sleep Time Off Mode
POWOFFMOD_NOSIG	After 10min No signal Off Mode
POWOFFMOD_FANSTOP	Fan Movement Error
POWOFFMOD_INSTOP	In-Stop Key Input



